Series 1952, No. 8

Issued September 1960

SOIL SURVEY

Fayette and Union Counties Indiana

OUR SOIL ★ OUR STRENGTH

Courtesy of
Ralph Harvey, M.C.
10th District of Indiana.

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SURVEY of Fayette and Union Counties will help the farmer to plan the kind of farming that will protect the soils and provide good yields. It will also assist engineers in selecting sites for roads, buildings, ponds, and other structures; serve as a reference for students and teachers; help prospective farmers, land appraisers, bankers, and real estate agents to decide the worth of a particular farm; and will add to the soil scientist's fund of knowledge.

In making this survey, soil scientists walked over the fields and woodlands. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noticed differences in the growth of crops, weeds, and brush; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming, engineering, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. Then, cartographers prepared from the photographs the detailed soil map in the back of this report. Fields, woods, roads, and many other landmarks can be seen on the map.

This soil survey is part of the technical assistance furnished by the Soil Conservation Service to the Fayette County Soil Conservation District and the Union County Soil Conservation District.

Locating the soils

Turn to the index to map sheets at the back of this report to locate areas on the large map. The index is a small map of these counties on which numbered rectangles have been drawn to show what part of the two counties each sheet of the large map covers. To locate your farm on this index map, look for roads, streams, towns, and other familiar boundaries. When you have found the correct sheet of the large map, you will note that boundaries of the soils are outlined and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil.

Suppose, for example, the area you have located on the map has a symbol RsB2. The legend for the detailed map shows that this symbol identifies Russell silt loam, 2 to 6 percent slopes, moderately eroded. This soil and all others mapped in these counties are described in the section, Soil Series and Mapping Units. The soil mapping units, the management groups to which they belong, and their capability class and subclass are listed in Guide to Mapping Units at the back of this report.

Finding information

Some readers will be more interested in one part of the report than another, for the report has special sections for different groups, as well as sections that may be of value to all.

Farmers and those who work with farmers will want to refer to the section, Soil Series and Mapping Units, to learn about the soils on their farm. They can then turn to the section, Management of the Soils, to find how these soils can be managed and what yields can be expected. The soils are listed in table 1, which summarizes suggested management for each. The average yields for a particular soil can be compared with yields to be expected under good management by turning to table 2. That table gives estimated average acre yields of principal crops on each soil under two levels of management.

Soil scientists will find information about how the soils were formed and how they were classified by reading the sections, Factors of Soil Formation, and Classification of Soils by Great Soil Groups.

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest. Those not familiar with the counties may want to refer to the sections, General Information About the Counties, and Agriculture, where information about the climate, transportation, industries, and agriculture are provided.

* * * * *

Fieldwork for this survey was completed in 1952. Unless otherwise indicated, all statements in the report refer to conditions in the county at that time.

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Series 1952, No. 8

Issued September 1960

SOIL SURVEY OF FAYETTE AND UNION COUNTIES, INDIANA

REPORT BY S. D. ALFRED, H. P. ULRICH, AND A. L. ZACHARY

FIELDWORK BY S. D. ALFRED, SOIL SURVEY,[1] UNITED STATES DEPARTMENT OF AGRICULTURE, AND T. E. BARNES AND H. P. ULRICH, PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

CORRELATION BY O. C. ROGERS, SENIOR SOIL CORRELATOR, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

THIS is a survey of Fayette and Union Counties. The two counties adjoin each other and are in the eastern part of Indiana. Union County borders the State of Ohio. Fayette County has an area of 215 square miles, or 137,600 acres. The area of Union County is 168 square miles, or 107,520 acres. The counties complement each other; Fayette County has many industries, but Union County is largely agricultural. The county seat of Fayette is Connersville, and that of Union County is Liberty. Connersville and Liberty are 55 miles and 65 miles, respectively, from Indianapolis, the State capital (fig. 1).

Management of the Soils

This section has three main parts. The first is based mainly on table 1, which lists the soils of Fayette and Union Counties by management groups. It also discusses general management of the soils. The second describes the system of land capability classification. The third provides estimated yields for the soils under two levels of management.

The soils in any one of the management groups listed in table 1 have about the same limitations, need about the same kind of management, and respond to management in approximately the same way. Table 1 gives for each management group suitable uses, suitable cropping systems, initial rates for application of lime, fertilization at two levels, dominant management problems, and supplementary practices needed.

General Management

Because it is not practical to explain the important elements of management in a table, cropping systems, liming, fertilization, organic matter, erosion, drainage, and the conservation of moisture are discussed in the following pages.

Cropping systems.—Good yields depend largely on the choice of a suitable cropping system. In addition, however, the soils will need adequate lime and fertilizer and protection from erosion and excess moisture.

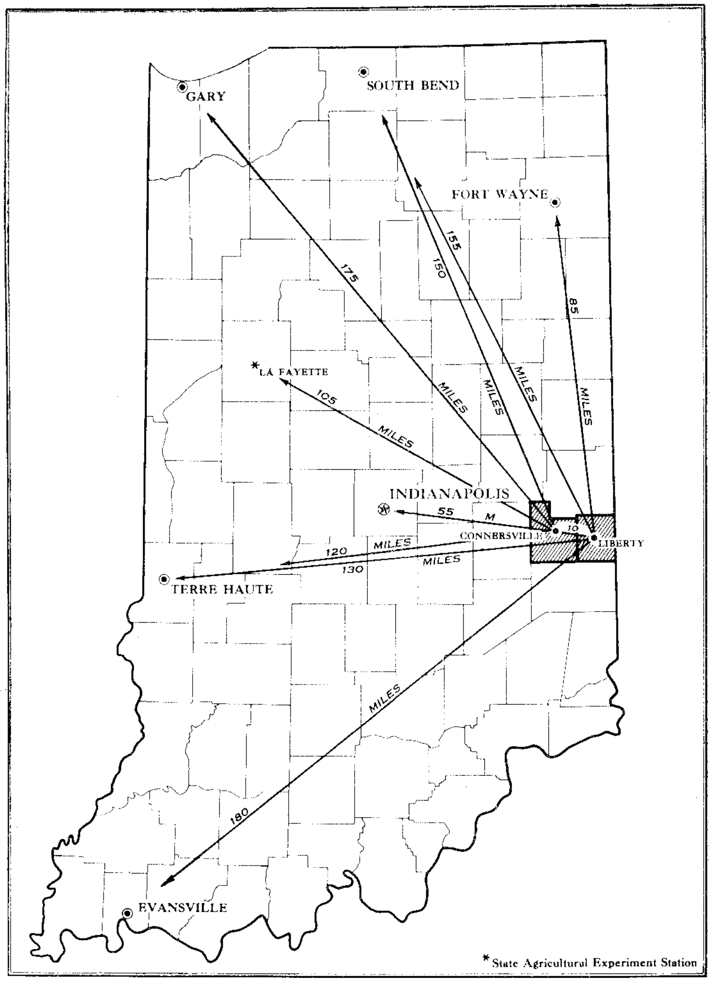

Figure 1.—**Location of Fayette and Union Counties in Indiana.**

[1] Fieldwork for this survey was done while Soil Survey was part of the Bureau of Plant Industry, Soils and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

TABLE 1.—*Suggested use and*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems[1] Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, moderately leached, well drained and moderately well drained soils:				
	Group 1A.—Nearly level soils	All crops generally grown in the area.	R–R–G(Sc)		
I	Birkbeck silt loam, 0 to 2 percent slopes.				
I	Manlove silt loam, 0 to 2 percent slopes.				
I	Martinsville silt loam, 0 to 2 percent slopes.				
I	Miami silt loam, 0 to 2 percent slopes.				
I	Russell silt loam, 0 to 2 percent slopes.				
I	Russell and Miami silt loams, 0 to 2 percent slopes.				
I	Xenia silt loam, 0 to 2 percent slopes.				
I	Xenia and Celina silt loams, 0 to 2 percent slopes.				
	Group 1B.—Gently sloping soils	Alfalfa, wheat	R–G–M–M	R–R–G–GM	R–R–G–M
IIe	Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Manlove silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Martinsville silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Milton silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Miami silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Russell silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded.				
IIe	Wynn silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Xenia silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded.				
	Group 1C.—Deep, moderately eroded, gently sloping soils.	Alfalfa	R–G–M–M–M	R–G–G–M	R–R–G–M
IIe	Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Manlove silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Martinsville silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Miami silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Milton silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Russell silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded.				
IIe	Wynn silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Xenia silt loam, 2 to 6 percent slopes, moderately eroded.				
IIe	Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded.				

See footnotes at end of table.

management for the soils

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
1–2	20 on wheat	20	20	50 on corn, 20 on wheat.	25	40	Maintenance of plant nutrients.	Use for corn, soybeans, or other crops that have a high cash value.
1–2	20 on wheat	20	20	50 on corn, 20 on wheat.	25	40	Slight risk of erosion	For control of runoff, till on the contour, grass the waterways, and use a cropping system that includes some close-growing crops; on slopes more than 200 feet in length, use terracing or stripcropping; if superior management is practiced, a somewhat more intensive cropping system can be used on all but the Milton and Wynn soils; on the Milton and Wynn soils, grow deep-rooted legumes and fall-seeded small grains to make the best use of the available moisture.
1–2	20 on wheat	20	20	50 on corn, 20 on wheat.	25	50	Moderate risk of erosion.	To control erosion, use contour tillage and grass the waterways, or use contour tillage and choose a cropping system that will protect the soil; on slopes more than 200 feet in length, use terracing or stripcropping; do not follow a row crop with a row crop unless practices are used to conserve the soil.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1]		
			Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, moderately leached, well drained and moderately well drained soils—Continued				
	Group 1D.—Severely eroded, gently sloping soils.	Long-term meadow and pasture.	G–M–M–M	R–G–M–M	R–R–G–M–M or R–R–G–M if terraced.
IIIe	Miami soils, 2 to 6 percent slopes, severely eroded.				
IIIe	Russell soils, 2 to 6 percent slopes, severely eroded.				
IIIe	Russell and Miami soils, 2 to 6 percent slopes, severely eroded.				
	Group 1E.—Slightly eroded, sloping soils.	Long-term meadow and pasture.	G–M–M–M	R–G–M–M–M	R–R–G–M–M or R–G–M–M–R–G–G(Sc) if terraced.
IIIe	Miami silt loam, 6 to 12 percent slopes, slightly eroded.				
IIIe	Russell silt loam, 6 to 12 percent slopes, slightly eroded.				
IIIe	Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded.				
	Group 1F.—Moderately eroded, sloping soils.	Long-term meadow and pasture.	G–M–M–M	R–G–M–M–M	R–G–M–M
IIIe	Martinsville silt loam, 6 to 12 percent slopes, moderately eroded.				
IIIe	Miami silt loam, 6 to 12 percent slopes, moderately eroded.				
IIIe	Russell silt loam, 6 to 12 percent slopes, moderately eroded.				
IIIe	Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded.				
IIIe	Wynn silt loam, 6 to 12 percent slopes, moderately eroded.				
	Group 1G.—Severely eroded, sloping soils.	Long-term meadow and pasture.	G–M–M–M	G–M–M–M	R–G–M–M–M or R–G–M–M if terraced.
IVe	Miami soils, 6 to 12 percent slopes, severely eroded.				
IVe	Russell soils, 6 to 12 percent slopes, severely eroded.				
IVe	Russell and Miami soils, 6 to 12 percent slopes, severely eroded.				
IVe	Wynn soils, 6 to 12 percent slopes, severely eroded.				
	Group 1H.—Slightly eroded, strongly sloping soils.	Alfalfa, bluegrass	Permanent pasture.	G–M–M–M	R–G–M–M–M
IVe	Miami silt loam, 12 to 18 percent slopes, slightly eroded.				
IVe	Russell silt loam, 12 to 18 percent slopes, slightly eroded.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
1–3	20 on wheat	20	25	20 on wheat	25	50	Serious risk of erosion, low supply of organic matter and plant nutrients, poor tilth.	To control erosion, use contour tillage and grass the waterways, or use contour tillage and choose a cropping system that will protect the soil; on slopes more than 200 feet in length, use terracing or stripcropping; do not follow a row crop with a row crop unless practices are used to conserve the soil; maintain a cover of plants on the soil, and increase the content of organic matter.
1–2	20 on wheat	20	25	20 on wheat	25	50	Serious risk of erosion	Maintain a cover of plants; choose a cropping system that will protect the soil, and use other practices to control runoff; on slopes 200 feet or more in length, use terracing or stripcropping; on terraced slopes of 6 to 9 percent, a cropping system consisting of R–R–G–M can be used.
1–3	20 on wheat	20	25	20 on wheat	25	50	Serious risk of erosion	Maintain a cover of plants; choose a cropping system that will protect the soil, and use other practices to control runoff; on slopes 200 feet or more in length, use terracing or stripcropping; on terraced slopes of 6 to 9 percent, a cropping system consisting of R–G–M can be used.
2–3	20 on wheat	20	25	20 on wheat	25	50	Serious risk of erosion, low supply of organic matter and plant nutrients, poor tilth.	Return the more severely eroded areas to permanent pasture.
1–2				20 on wheat	25	50	Unfavorable slopes for cropping; serious risk of erosion if not covered by vegetation.	If the slope permits, renovate permanent pastures where needed; reseed with a legume-grass mixture of ladino clover or birdsfoot trefoil, bromegrass, Kentucky bluegrass, and orchardgrass; use a rotational grazing system; control weeds in the pastures.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1]		
			Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, moderately leached, well drained and moderately well drained soils—Continued				
	Group 1J.—Moderately eroded and severely eroded, strongly sloping soils.	Permanent pasture or woodland.	----------	----------	G–M–M–M----
IVe	Martinsville silt loam, 12 to 18 percent slopes, moderately eroded.				
IVe	Miami silt loam, 12 to 18 percent slopes, moderately eroded.				
IVe	Miami soils, 12 to 18 percent slopes, severely eroded.				
IVe	Russell silt loam, 12 to 18 percent slopes, moderately eroded.				
VIe	Russell soils, 12 to 18 percent slopes, severely eroded.				
IVe	Wynn silt loam, 12 to 25 percent slopes, moderately eroded.				
	Group 1K.—Slightly eroded and moderately eroded, moderately steep soils.	Permanent pasture or woodland.	----------	----------	----------
VIe	Miami silt loam, 18 to 25 percent slopes, slightly eroded.				
VIe	Miami silt loam, 18 to 25 percent slopes, moderately eroded.				
VIe	Russell silt loam, 18 to 25 percent slopes, slightly eroded.				
VIe	Russell silt loam, 18 to 25 percent slopes, moderately eroded.				
	Group 1L.—Severely eroded, moderately steep soils.	Permanent pasture or woodland.	----------	----------	----------
VIIe	Miami soils, 18 to 25 percent slopes, severely eroded.				
VIIe	Russell soils, 18 to 25 percent slopes, severely eroded.				
	Medium-textured, deep, light-colored, strongly leached, well drained and moderately well drained soils:				
	Group 2A.—Slightly eroded, gently sloping soil.	----------	R–G–M–M–M--	R–G–M or R–G–G–M–M.	R–R–G–M–M--
IIe	Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded.				
	Group 2B.—Moderately eroded to severely eroded, gently sloping soil.	----------	R–G–M–M–M--	R–G–G–M–M--	R–R–G–M–M--
IIe	Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded.				
	Group 2C.—Slightly eroded, sloping soil.	----------	G–M–M–M----	R–G–M–M–M--	R–G–G–M–M or R–R–G–M–M.
IIIe	Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded.				
	Group 2D.—Moderately eroded, sloping soil.	----------	Permanent vegetation.	G–M–M–M----	G–M–M–M----
IIIe	Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded.				
	Group 2E.—Severely eroded, sloping soils.	Permanent vegetation--	----------	----------	----------
IVe	Cincinnati soils, 6 to 12 percent slopes, severely eroded.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
1–2					20	20	Unfavorable slopes for cropping; serious risk of erosion if not covered by vegetation.	If the slope permits, renovate permanent pastures where needed; reseed with a legume-grass mixture of ladino clover or birdsfoot trefoil, bromegrass, Kentucky bluegrass, and orchardgrass; use a rotational grazing system; control weeds in the pastures.
1–2					20	20	Unfavorable slopes for cropping; serious risk of erosion if not covered by vegetation.	If the slope permits, renovate permanent pastures where needed; reseed with a legume-grass mixture of ladino clover or birdsfoot trefoil, bromegrass, Kentucky bluegrass, and orchardgrass; use a rotational grazing system; control weeds in the pastures.
1–2					20	20	Unfavorable slopes for cropping; serious risk of erosion if not covered by vegetation.	If the slope permits, renovate permanent pastures where needed; reseed with a legume-grass mixture of ladino clover or birdsfoot trefoil, bromegrass, Kentucky bluegrass, and orchardgrass; use a rotational grazing system; control weeds in the pastures.
3–4	30 on wheat	25	35	40 on corn, 30 on wheat.	40	55	Serious risk of erosion, strong acidity, and low supply of plant nutrients.	Grass the waterways and use contour tillage and other suitable practices to conserve the soil.
3–4	30 on wheat	30	35	40 on corn, 30 on wheat.	50	50		Grass the waterways and use contour tillage and other suitable practices to conserve the soil.
3–4	30 on wheat	30	35	40 on corn, 30 on wheat.	50	50		Grass the waterways and use contour tillage and other suitable practices to conserve the soil.
3–4	30 on wheat	30	35	40 on corn, 30 on wheat.	50	50		Grass the waterways and use contour tillage and other suitable practices to conserve the soil.
3		20	20		30	30	Serious risk of erosion	Renovate pastures or return the areas to trees; use a pasture mixture that contains orchardgrass, timothy or redtop, and ladino clover or lespedeza, depending on the acidity of the soil and on the supply of plant nutrients.

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TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1]: Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, deep, light-colored, strongly leached, well drained and moderately well drained soils—Continued				
	Group 2F.—Slightly eroded to severely eroded, strongly sloping soils.	Permanent vegetation			
IVe	Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded.				
IVe	Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded.				
VIe	Cincinnati soils, 12 to 18 percent slopes, severely eroded.				
	Group 2G.—Slightly eroded to severely eroded, moderately steep soils.	Permanent vegetation			
VIe	Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded.				
VIe	Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded.				
VIIe	Cincinnati soils, 18 to 25 percent slopes, severely eroded.				
	Group 2H.—Eroded, steep soil	Permanent pasture or timber.			
VIIe	Cincinnati silt loam, 25 to 45 percent slopes, eroded.				
	Dark-colored, neutral, gently sloping to very steep soils:				
	Group 3A.—Gently sloping to sloping soils.	Tobacco, alfalfa	R–G–M–M–M		
IVe	Fairmount silty clay loam, 2 to 6 percent slopes.				
IVe	Fairmount silty clay loam, 6 to 12 percent slopes.				
	Group 3B.—Strongly sloping soil	Alfalfa and permanent pasture.	Permanent pasture.	G–M–M–M	G–M–M–M
IVe	Fairmount silty clay loam, 12 to 18 percent slopes.				
	Group 3C.—Moderately steep to steep soils.	Permanent pasture or trees.			
VIe	Fairmount silty clay loam, 18 to 25 percent slopes.				
VIIe	Fairmount silty clay loam, 25 to 35 percent slopes.				
VIIe	Hennepin loam, 25 to 35 percent slopes, slightly eroded.				
VIIe	Hennepin loam, 25 to 35 percent slopes, moderately eroded.				
	Group 3D.—Very steep soils	Trees			
VIIe	Fairmount silty clay loam, 35 to 50 percent slopes.				
VIIe	Hennepin loam, 35 to 50 percent slopes, slightly eroded.				
VIIe	Hennepin loam, 35 to 50 percent slopes, moderately eroded.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
3		20			30	30	Serious risk of erosion	Renovate pastures or return all cleared areas to permanent pasture.
3		20			30	30	Serious risk of erosion	Retain trees on all the steeper Cincinnati soils.
							Serious risk of erosion	Retain the present trees and replant cleared areas to trees.
0		20	20		25	25	Serious risk of erosion	To reduce erosion, grass the waterways and use contour tillage and other suitable erosion-control practices; maintain a cover of plants on the soil; Fairmount silty clay loam, 6 to 12 percent slopes, is better suited to alfalfa than the less sloping soil, and a cropping system consisting of G–M–M–M can be used if the soil is tilled on the contour or if it is used without practices to control erosion; also, this soil needs 5 pounds less each of water-soluble potash and available phosphate, if superior management is used, than the less sloping soil in this group.
0					20	20	Serious risk of erosion	To reduce erosion, grass the waterways and use contour tillage and other suitable practices to conserve the soil; maintain a cover of plants.
0					20	20		Not suitable for cropping.
								Not suitable for cropping.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems[1]: Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, well drained to somewhat excessively drained soils underlain by sand and gravel:				
	Group 4A.—Level soils	Crops generally grown in area, particularly alfalfa and wheat.	R–R–G–M–M	Not needed	
IIs	Fox loam, 0 to 2 percent slopes.				
IIs	Fox silt loam, 0 to 2 percent slopes.				
IIs	Nineveh loam.				
I	Ockley silt loam, 0 to 2 percent slopes.				
	Group 4B.—Slightly eroded, gently sloping soils.	Crops generally grown in area, particularly alfalfa and wheat.	R–G–M–M	R–R–G–M–M	R–R–G–M–M
IIs	Fox loam, 2 to 6 percent slopes, slightly eroded.				
IIs	Fox silt loam, 2 to 6 percent slopes, slightly eroded.				
IIe	Ockley silt loam, 2 to 6 percent slopes, slightly eroded.				
	Group 4C.—Moderately eroded and severely eroded, gently sloping soils.	Crops generally grown in area, particularly alfalfa and wheat.	R–G–M–M–M	R–G–M–M–R–G–G(Sc).	R–R–G–M–M
IIs	Fox loam, 2 to 6 percent slopes, moderately eroded.				
IIs	Fox silt loam, 2 to 6 percent slopes, moderately eroded.				
IIs	Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded.				
IIe	Ockley silt loam, 2 to 6 percent slopes, moderately eroded.				
IIIe	Ockley soils, 2 to 6 percent slopes, severely eroded.				
	Group 4D.—Moderately eroded, sloping soils.	Wheat and fall-seeded grains and alfalfa, sweetclover, and other deep-rooted legumes.	G–M–M–M	R–G–M–M	R–G–G–M–M or R–R–G–M–M if terraced.
IIIs	Fox loam, 6 to 12 percent slopes, moderately eroded.				
IIIs	Fox silt loam, 6 to 12 percent slopes, moderately eroded.				
IIIs	Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded.				
IIIe	Ockley silt loam, 6 to 12 percent slopes, moderately eroded.				
	Group 4E.—Severely eroded, sloping soils.		G–M–M–M	G–M–M–M	R–G–M–M or R–G–M M–R–G–G(Sc) on 6 to 9 percent slopes if terraced.
IVs	Fox soils, 6 to 12 percent slopes, severely eroded.				
IVs	Fox soils, kames, 6 to 12 percent slopes, severely eroded.				
IVe	Ockley soils, 6 to 12 percent slopes, severely eroded.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
0–2	20 on wheat	20	25	40 on corn, 20 on wheat.	35	50	Moderate to low moisture-supplying capacity.	Plant alfalfa, bromegrass, wheat, soybeans, and other drought-resistant crops, and irrigate where feasible; a more intensive cropping system of corn, soybeans, and a small grain with an intercrop of sweetclover can be used if the moisture supply is adequate and the supply of plant nutrients is maintained; except for oats and corn, most of the common crops can be grown on the Ockley soil during periods of prolonged drought; the Nineveh soil is slightly acid to calcareous, and much of it is best used for alfalfa.
1–3	20 on wheat	20	25	40 on corn, 20 on wheat.	35	50	Moderate moisture-supplying capacity; risk of erosion.	Grass the waterways and use contour tillage and other erosion-control practices, where feasible.
1–3	20 on wheat	20	25	40 on corn, 20 on wheat.	30	50	Moderate to low moisture-supplying capacity; moderate to severe risk of erosion.	Grass the waterways and use contour tillage and other erosion-control practices where feasible; on Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded, and on severely eroded areas of Ockley soils, use a cropping system that provides ample ground cover.
1–2	20 on wheat	20	25	20 on wheat	30	50	Low moisture-supplying capacity; serious risk of erosion.	If these soils are cropped intensively, use all the practices feasible to protect them from erosion.
1–2							Low moisture-supplying capacity; serious risk of erosion.	Use only for limited cropping unless practices are used to protect the soils from erosion.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1]: Without conservation practices	Suitable cropping systems [1]: With contour tillage	Suitable cropping systems [1]: With contour tillage and stripcropping or terracing
	Medium-textured, well drained to somewhat excessively drained soils underlain by sand and gravel—Continued				
	Group 4F.—Light and moderately dark colored, slightly eroded to severely eroded, strongly sloping soils.	Alfalfa and permanent pasture.	----------------	G–M–M–M----	G–M–M–M----
IVs	Fox silt loam, 12 to 18 percent slopes, slightly eroded.				
IVs	Fox silt loam, 12 to 18 percent slopes, moderately eroded.				
IVe, VIe	Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded.				
VIe	Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded.				
IVs, VIe	Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded.				
VIe, VIIe	Fox and Rodman soils, 12 to 18 percent slopes, severely eroded.				
VIe	Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded.				
	Group 4G.—Light and moderately dark colored, slightly eroded and moderately eroded, moderately steep soils.	Alfalfa and permanent pasture.	Not suited to rotation crops.	----------------	----------------
VIe, VIIe	Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded.				
VIIe	Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded.				
VIIe	Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded.				
	Group 4H.—Moderately dark-colored, eroded, steep to very steep soil.	Permanent vegetation, chiefly woodland.	Not suited to rotation crops.	----------------	----------------
VIIe	Rodman gravelly loam, 25 to 50 percent slopes, eroded.				
	Medium-textured, moderately or strongly leached, poorly or somewhat poorly drained soils of the uplands and terraces:				
	Group 5A.—Nearly level soils-------	General crops---------	R–R–G(Sc), R–R–G–M–M–R–G(Sc), R–R–G–M.	----------------	----------------
IIw	Crosby silt loam, 0 to 2 percent slopes.				
IIIw	Delmar silt loam.				
IIw	Fincastle silt loam, 0 to 2 percent slopes.				
IIw	Fincastle and Crosby silt loams, 0 to 2 percent slopes.				
IIw	Homer silt loam.				
IIw	Reesville silt loam, 0 to 2 percent slopes.				
IIw	Reesville silt loam, 0 to 2 percent slopes, moderately eroded.				
IIw	Whitaker silt loam, 0 to 2 percent slopes.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
0–2	-----	-----	-----	-----	-----	-----	Droughtiness, unfavorable slopes, and serious risk of erosion.	The moderately eroded soils are well suited to meadow; the moderately eroded and severely eroded soils require an initial application of as much as 2 tons of lime per acre; the severely eroded soils require 20 pounds of available P_2O_5 and 40 pounds of K_2O per acre under superior management; in areas where the severely eroded soils have slopes 200 feet or more in length, it is helpful to use buffer strips between the contour strips.
0–2	-----	-----	-----	-----	20	40	Droughtiness, unfavorable slopes, and serious risk of erosion.	
-----	-----	-----	-----	-----	-----	-----	Droughtiness, unfavorable slopes, and serious risk of erosion.	
1–3	40 on corn, 20 on wheat.	20	25	60 to 100 on corn, 20 on wheat.	30	50	Poor drainage	Apply large amounts of fertilizer to build up the content of organic matter; crop the darker colored soils more intensively than the others; where needed, install tile drains at depths of about 3 feet and about 3 or 4 rods apart; crop the Delmar soil the least intensively using an R–R–G–M cropping system and placing tile drains at 2- to 3-rod intervals; drain the Homer soil through the adjacent Westland soil; use contour tillage on Reesville silt loam, 0 to 2 percent slopes, moderately eroded.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1] Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Medium-textured, moderately or strongly leached, poorly or somewhat poorly drained soils of the uplands and terraces—Continued				
	Group 5B.—Slightly eroded and moderately eroded, gently sloping soils.	General crops	R–G–M–M	R–R–G–G–M	R–R–G–M
IIw	Crosby silt loam, 2 to 6 percent slopes, slightly eroded.				
IIw	Crosby silt loam, 2 to 6 percent slopes, moderately eroded.				
IIw	Fincastle silt loam, 2 to 6 percent slopes, slightly eroded.				
IIw	Fincastle silt loam, 2 to 6 percent slopes, moderately eroded.				
IIw	Fincastle and Crosby silt loams, 2 to 6 percent slopes.				
IIw	Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded.				
IIw	Reesville silt loam, 2 to 6 percent slopes, moderately eroded.				
IIw	Whitaker silt loam, 2 to 6 percent slopes.				
	Group 5C.—Strongly leached, nearly level soil of uplands.	----------	R–R–G–M	----------	----------
IIw	Avonburg silt loam, 0 to 2 percent slopes.				
	Group 5D.—Moderately eroded, gently sloping soil.	----------	R–G–M–M–M	R–G–G–M–M	R–R–G–M–M
IIw	Avonburg silt loam, 2 to 6 percent slopes, eroded.				
	Dark-colored, nearly level, poorly drained to very poorly drained soils of the uplands, terraces, and bottoms:				
	Group 6A.—Slightly acid to neutral soils, underlain by loamy till.	Corn, soybeans, small grains.	R–R–G(Sc), R–R–R–G–M–M–R–G(Sc), R–R–G–M–R–G(Sc).	----------	----------
IIw	Brookston silty clay loam.				
IIw	Brookston silt loam.				
IIw	Cope silty clay loam.				
IIw	Cope silt loam.				
IIw	Kokomo silty clay loam.		R–R–G–M–M.		
	Group 6B.—Mildly alkaline to neutral soil, underlain by stratified silt loam.	Corn, soybeans, small grains.	Continuous row crops or continuous meadow.	----------	----------
IIw	Sloan silt loam.				
	Group 6C.—Slightly acid to neutral soil, underlain by stratified gravel and sand.	Corn, soybeans, small grains.	R–R–G(Sc)	----------	----------
IIw	Westland silt loam.				

See footnotes at end of table.

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
1–3	40 on corn, 20 on wheat.	20	25	60 on corn, 20 on wheat.	25	45	Poor drainage and erosion.	Apply large amounts of fertilizer to build up the content of organic matter; crop the darker colored soils more intensively than the others; where needed, install tile drains at depths of about 3 feet and about 3 or 4 rods apart; provide surface drainage for level areas; grass the waterways and use contour tillage and other suitable practices to conserve the soil, as needed; on the moderately eroded soils, use a cropping system of R–G–M–M–M if no erosion-control practices are used and a cropping system of R–G–G–M–M if the soils are tilled on the contour.
3–4	40 on corn, 20 on wheat.	20	25	80 on corn, 30 on wheat.	25	50	Drainage, strong acidity, low supply of plant nutrients.	Provide artificial drainage, preferably by bedding the soil; apply adequate lime and large amounts of fertilizer.
3–4	40 on corn, 20 on wheat.	20	25	80 on corn, 30 on wheat.	25	50	Drainage, strong acidity, low supply of plant nutrients.	Provide artificial drainage, preferably by bedding the soil; apply adequate lime and large amounts of fertilizer; use contour tillage and other suitable practices to conserve the soil.
0	----------	20	20	40 on first-year corn, 80 on second-year corn.	25	35	Poor drainage; ponding sometimes injures alfalfa, red clover, and wheat.	Drain by placing tile at depths of about 3 to 3½ feet and about 5 rods apart; in places the supply of potash is low, especially where the Kokomo soil has a high content of organic matter; in places the soils are clayey and may require fall plowing.
0	----------	20	20	50 on corn	30	30	Poor drainage; ponding sometimes injures alfalfa, red clover, and wheat.	Protect from overflow; drain by open ditches or tile if suitable outlets are available.
0	----------	20	25	40 on corn, 20 on wheat.	25	45	Poor drainage; ponding sometimes injures alfalfa, red clover, and wheat.	Drain by open ditches or tile placed at depths of 3 feet and about 5 rods apart; install tile with care to prevent filling with sand from the substratum.

TABLE 1.—*Suggested use and man*

Capability class and subclass	Management group and soil	Crops well suited	Suitable cropping systems [1]: Without conservation practices	With contour tillage	With contour tillage and stripcropping or terracing
	Soils of the bottom lands:				
	Group 7A.—Well-drained soils	Row crops; alfalfa on sandy soil; pasture on small bottoms.	Continuous corn, R–R–G(Sc).	------	------
I	Genesee silt loam.				
I	Genesee silt loam, high bottom.				
I	Genesee loam.				
I	Genesee loam, high bottom.				
I	Genesee gravelly loam.				
I	Genesee fine sandy loam.				
I	Ross silt loam.				
	Group 7B.—Moderately well drained and somewhat poorly drained soils that are frequently flooded.	Permanent pasture and timber.	Continuous row crop.	------	------
IIw	Eel silt loam.				
IIw	Eel loam.				
IIw	Shoals silt loam.				

[1] R=row crop, as corn, soybeans, or vegetables; G=small grain, as oats, wheat, rye, or barley; M=meadow, as 1 or more years of alfalfa, red clover, timothy, or ladino clover; Sc=sweetclover catch crop; each symbol except (Sc) indicates 1 year of that crop.

[2] Test soil before liming; if limestone used is coarser than standard commercial grade, use an amount 50 percent greater than if standard commercial grade were applied; if legumes are to be seeded after liming and immediate results are desired, double this amount.

[3] Based on pounds of available nitrogen (N), available phosphorus (P_2O_5), and water-soluble potash (K_2O) required per acre annually under the first rotation listed for each management group; if the supply of plant nutrients is low, superior management requires that heavy applications of phosphorus, potassium, and perhaps nitrogen fertilizers be used in addition to the amounts recommended for maintenance; see text for a sample calculation of a fertilizer program to be used on a specific soil.

Table 1 gives the most intensive cropping systems suitable for the soils of these two counties and indicates supporting practices suitable for each cropping system. The cropping systems suggested take into account the limitations of the soil. They also take into account the fact that row crops deplete the soil more than close-growing crops and that legumes and grasses, grown together, help build up the soil. For convenience in comparing the cropping systems given in table 1 and in determining the extent to which they will deplete the soil, 18 cropping systems are given in the following list. These are arranged in progressive order, according to their depleting effect on the soil, the least depleting first.

A more depleting cropping system can be used if the soil is tilled on the contour and if stripcropping and terracing are used than if these practices are not followed. The farmer must decide whether he will use a less depleting cropping system without using conservation practices or a more depleting cropping system with suitable conservation practices.

Cropping system:[1]

1. G–M–M–M
2. R–G–M–M–M
3. R–G–M–M
4. R–G–G–M–M
5. R–G–M–M–R–G–G (Sc)
6. R–G–M
7. R–R–G–M–M
8. R–G–M–R–G(Sc)
9. R–G–G–M
10. R–R–G–G–M
11. R–R–G–M
12. R–R–G–M–R–G(Sc)
13. R–G(Sc)
14. R–R–R–G–M–M–R–G(Sc)
15. R–R–R–G–M
16. R–R–R–R–G–M
17. R–R–G(Sc)
18. Continuous row crop, mainly corn.

[1] R=corn or soybeans; G=small grain; M=legume-grass meadow; (Sc)=intercrop consisting of a legume-grass mixture that usually includes sweetclover. The intercrop is sown in a small grain and is plowed down for the crop to follow. Each symbol, except the intercrop shown in parenthesis as (Sc), indicates 1 year of the crop.

It is desirable to mix legumes with grasses in the sod crop in whatever cropping system is chosen. If alfalfa can be grown successfully, it should be included in the legume-grass mixture. Ladino clover is desirable in the

agement for the soils—Continued

Initial lime requirement [2]	Fertilization [3]						Chief management problems	Other soil management practices needed and remarks
	Average management [4]			Superior management [5]				
	N	P_2O_5	K_2O	N	P_2O_5	K_2O		
Tons per acre	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		
0				80 on corn	20	20	Stream overflow	In areas of these soils along the larger streams, keep a strip of trees along the banks of the stream for protection from erosion and to prevent the streams from washing into old stream courses; build levees to protect larger areas from stream overflow or plant crops that will mature during the season normally free of floods; supplement tillage by spraying with 2,4–D for weed control as needed; the high bottom soils are infrequently flooded and are well suited to alfalfa; under average management, corn on the soils of the high bottoms requires 50 pounds of available nitrogen per acre annually where a 3-year rotation of R–R–G(Sc) is used; the high bottom soils require 20 pounds per acre each of available phosphorus and potassium under average management and, under superior management, 30 pounds each of those elements.
0		20	20	40 on corn	30	30	Stream overflow, channel cutting.	If corn drowns out, soybeans or buckwheat can be planted and may have time to mature.

[4] Average management is that commonly used in Fayette and Union Counties; intensive practices to control erosion, to add organic matter to the soil, or to maintain and increase the supply of plant nutrients are not generally used.

[5] Superior management consists of using more careful and intensive practices than are generally used in these counties; more attention is given to the control of insects, disease, and weeds, to selecting suitable crops, and to using the correct kinds and amounts of fertilizer; where feasible, cropping systems are used that include legumes; contour tillage, stripcropping, terracing, and construction of diversion ditches are suitable practices to use in controlling erosion.

mixture if the meadow is to be grazed. The seed needs to be inoculated if legumes have not been grown on the soil before. Also, lime should be added because legumes will not grow well on acid soils. If a meadow is to remain for 2 years or more, bromegrass or orchardgrass is preferable to timothy in the seeding mixture, because it is more drought resistant and higher yielding.

Liming.—Many of the soils in Fayette and Union Counties are acid. Lime must be added before plants can take full advantage of the nutrients that are in the soil or that are applied in fertilizer. The soils in each field need to be tested, and then lime should be applied according to the requirements of the crop to be grown. Instructions for sampling and testing the soils can be obtained from the county agent or from the Plant and Soil Laboratory, Purdue University, Agricultural Experiment Station, West Lafayette, Ind.

Legumes are particularly sensitive to soil acidity. If legumes are to be grown, apply enough lime to bring the pH level to 6.5 or 7.0. Alfalfa requires a pH of 6.5, and sweetclover, a pH of 7.0. The amount of lime needed on soils that have not been limed is given in table 1.

Fertilization.—Much of the success of a crop depends upon the supply of plant nutrients in the soil, mainly upon the amounts of available nitrogen, phosphorus, and potassium. These elements need to be added in the form of commercial fertilizer if uniformly high yields are to be obtained on most of the soils in Fayette and Union Counties. The amounts to be applied will depend on the needs shown by soil tests, on the kind of crop to be grown, and on the management used. The need may be modified by drought or by other factors.

The rates for applying commercial fertilizer are given in table 1 for two levels of management. The rates given for average management can be used by the farmer who wants immediate returns for a small investment in fertilizer. The ones given for superior management are for the farmer who wants to build up reserves of needed elements and to maintain a good supply of plant nutrients. The rates are based on the cropping systems suggested in table 1. It is assumed that tests have shown that the soils contain a moderate amount of phosphorus and potassium. For soils testing low in these two elements, a higher rate of fertilization will be required.

Nitrogen.—The supply of nitrogen in most of the soils of these two counties, and especially in the light-colored soils, is too low for crops to make high yields. Usually, additional nitrogen is obtained for succeeding crops by growing a legume for hay or by growing a cover crop. In some soils the supply of nitrogen becomes available too slowly to meet the needs of maturing wheat, corn, oats, or similar crops. Nitrogen fertilizer must be added to these soils.

Wheat requires nitrogen as a starter in fall. Usually, it will also respond well if it is topdressed with 20 to 30 pounds of soluble nitrogen in spring. The response is especially good on light-colored soils. Corn requires additional nitrogen in summer just before and during the time the ears are filling. The need is especially great if the corn is on high-lying soils that are light colored, eroded, or sandy. If tilth, drainage, and the supply of moisture are all adequate and if the soil contains enough available phosphorus and potassium, 40 to 100 pounds of nitrogen can be plowed down or applied as a side dressing for corn. Use the larger amounts on corn grown for 2 or more years in succession.

Phosphorus.—The phosphorus in the soil has accumulated during the long process of soil formation. The only part of it readily available to plants, however, is contained in the organic matter. If the soil is acid, less of the phosphorus is available to plants. Therefore, there is a larger supply of available phosphorus in the neutral and slightly alkaline bottom-land soils and in other dark-colored soils that have a high content of organic matter than in other soils. Even in these soils, however, phosphorus is lost through the removal of crops more rapidly than it can be restored through the weathering of the soil material or through the return of crop residues or manure.

All crops, including hay and pasture, need phosphorus. Liberal amounts of phosphate should be used. Because much of the phosphorus that is applied will be fixed in the soil in a form not readily available to crops, much larger amounts should be added than the crops actually need.

Potassium.—Silty and clayey soils contain more potassium than sandy soils, which are low in that element. The organic soils are also deficient in potassium. Most of the potassium in the soil remains in an insoluble or inorganic form; therefore, little of it is lost through leaching. The potassium in manure or crop residues, however, is soluble and is leached out of the soil easily. In contrast, the potassium added as commercial fertilizer readily becomes part of the supply in the soil.

In many soils the subsoil contains more potassium than the surface soil. This is more often true in soils that have a clayey subsoil than in soils that have a coarse-textured subsoil. This supply of potassium can be reached by alfalfa, ladino clover, and other deep-rooted plants. Some soils are somewhat poorly drained and slowly permeable; these may have a heavy clay subsoil that restricts the development of roots. Crops on such soils will need to have large amounts of potassium added, because the roots cannot reach the supply in the subsoil or cannot utilize the potassium.

Amounts of fertilizer needed.—The fertilizer rates given in table 1 can be used in the following way to calculate the amounts of fertilizer needed for a particular soil. Miami silt loam, 2 to 6 percent slopes, slightly eroded, for example, is in management group 1B. For the soils of management group 1B, a 4-year cropping system consisting of corn, a small grain, and 2 years of mixed grass-legume meadow is suggested if special practices are not used to control erosion. Under average management for the soils of management group 1B, 20 pounds each of available phosphorus and potassium are suggested each year; therefore, 80 pounds of each would be applied over the 4-year period. If 100 pounds of 5–20–20 is applied per acre to corn in the row and 300 pounds is drilled in with the small grain, the equivalent of 80 pounds of available phosphorus and potassium and 20 pounds of nitrogen would be applied over the 4-year period.

Under either level of management, when the difference between the amounts needed and the amounts put on is large enough, an application can be broadcast to make up the difference. This application can be made either after the second-year meadow has been cut for the first time or before the soil is plowed for corn. If the deficit is small, it can be made up either by a change in the fertilizer analysis or by increasing the amount applied to small grains.

Erosion control.—Erosion varies with the kind of soil, with the length and steepness of slopes, and with the use and management of the soils. When the original plant cover is removed, runoff increases and the risk of erosion becomes greater. Crops that are clean tilled provide less protection than wheat or other close-growing crops; the close-growing crops, in turn, provide less protection than sod.

If the soil is used for tilled crops, erosion can be reduced by increasing the content of organic matter, by using a cropping system that includes more cover crops and sod crops than clean-tilled crops, and by tilling on the contour, stripcropping, terracing, and using other practices to conserve the soil.

Erosion is a dominant factor in managing many of the soils in these counties. The soils can be protected by using the supplementary practices indicated in table 1 along with the cropping systems and amounts of fertilizer suggested.

Drainage.—Excess water must move rapidly downward through the soil if plants are to grow well. The soil must be well drained to depths of 3 feet or more.

The gray color of the surface soil and the mottling in the subsoil show that many of the soils in these counties have impaired, or poor, natural drainage. Such soils are difficult to manage and have limited use; the crops grown on them produce low yields. These soils can be improved by artificial drainage. When the soils are drained adequately, the supply of oxygen improves; plants develop deeper and stronger root systems; and they are able to draw nutrients from the entire profile. The soils that need drainage and protection from overflow are indicated in table 1.

Conserving moisture.—In planning the management of a soil, its ability to resist drought should be considered. For example, a large amount of fertilizer applied on a droughty soil may be at least partly wasted because there is not enough moisture available for it to be used by plants. One of the best ways to improve the moisture-holding capacity of a droughty soil is to add organic matter to it.

Organic matter.—The organic matter in the soils absorbs and holds moisture for plants, serves as a storage place for nitrogen, improves tilth, and increases the resistance to erosion. A shortage of organic matter seriously limits the productivity of the soils. All of the light-colored soils in these counties, and particularly the light-colored, poorly drained, sandy, and eroded soils, need more organic matter.

The basic means of maintaining organic matter is to use a suitable cropping system, add correct amounts of fertilizer and lime, and use practices to protect the soils from erosion and overflow. The legumes and grasses grown in each cropping system help to build up the soil and to replenish the organic matter. They should be grown long enough to offset the losses caused by corn or other soil-depleting crops.

The cropping system should be supported by other practices. All of the crop residues and manure available should be returned to the soil and turned under. Before manure is spread on the field, it needs protection from the weather, or rainfall will leach out much of the nitrogen and potassium. Follow corn or other clean-tilled crops with a cover crop. Otherwise, the soil may gradually lose its surface layer through erosion. The surface layer is the part of the soil that contains the most organic matter and plant nutrients.

How organic matter will be replenished depends upon the kind of soil and the choice of the farmer. If a soil has reasonably good tilth, organic matter can be built up by using nitrogen fertilizer to increase the growth of the crop and the amount of residue. Large amounts of nitrogen increase the growth of plants, and the extra growth is returned to the soil either in the form of crop residues or manure. Heavy applications of nitrogen thus allow use of soil-depleting crops during a greater proportion of the cropping system. Extra nitrogen will be needed to aid in decomposing large amounts of straw, corn stover, or other similar material that is plowed down.

If a soil has poor tilth, it may not be practical to restore organic matter by the increased use of nitrogen fertilizer. The poor tilth prevents plants from making use of the extra nitrogen. For these soils, alfalfa, sweetclover, and other deep-rooted legumes are the best choice. The deep-reaching roots loosen the soil so air and water can penetrate; the bacteria living on the roots provide nitrogen; and the whole plant, when plowed under, adds organic matter. Normally, it is best to sow legumes in a mixture with grasses. The grasses benefit from the nitrogen furnished by the legumes. In addition, the mixture of plants having different growth periods provides cover for a longer time each year and there is less danger of losing the stand of legumes through frost heaving.

Capability Grouping of Soils

Capability grouping is a system of classification used to show the relative suitability of the soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs and limitations of the soils, on the risk of damage to them, and also on their response to management. There are three levels above the soil mapping unit in this grouping. They are the capability unit, subclass, and class.

The capability unit is the lowest level of capability grouping. A capability unit is made up of soils that are similar in kind of management needed, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" indicates that the main limiting factor is risk of erosion if a cover of plants is not maintained; "w" means excess water that retards the growth of plants or interferes with cultivation; and "s" shows that the soils are shallow, droughty, or unusually low in fertility. In some parts of the country, there is a subclass "c" for soils that are limited chiefly by a climate that is too cold or too dry.

The broadest grouping, the land capability class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All the land classes, except class I, may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly but do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use than those in classes I and II. These need even more careful management.

In class IV are soils that have greater natural limitations than those in class III but that can be cultivated occasionally for some crops under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but that can be used for pasture or range, as woodland, or for wildlife.

Class V soils are nearly level and gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops, because they are steep, droughty, or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that forest trees can be set out or pastures seeded.

Class VII soils provide only poor to fair yields of forage or forest products and have characteristics that limit them severely for these uses.

Class VIII consists of soils that have practically no agricultural use. The soils have value as parts of watersheds, and some have value as wildlife habitats or for scenery.

In Fayette and Union Counties, there are no soils in classes V and VIII.

Estimated Yields

Table 2 gives estimated long-term average acre yields of principal crops for each soil under common and improved management. The estimates in columns A indicate yields obtained under practices prevailing in these counties between 1945 and 1950. Under this management, small to moderate amounts of commercial fertilizer were used but careful control of erosion, addition of organic matter, and the maintenance and increase of plant nutrients and productivity were not practiced. Average yields of some of the crops in the two counties for 1946–1955 are as follows:

	Fayette	*Union*
Corn (bu.)	57. 2	61. 5
Wheat (bu.)	26. 2	21. 4
Oats (bu.)	37. 3	40. 2
Soybeans (bu.)	23. 0	23. 2
Mixed hay (tons)	1. 43	1. 36

Yields under more careful and intensive practices are given in column B. These practices are (1) regular use of a cropping system that includes legumes wherever it is practical to grow them, (2) use of barnyard and green manure, (3) application of lime and liberal quantities of commercial fertilizer, (4) use of tested seed, (5) control of weeds, insects, and diseases, (6) installation of artificial drainage where needed, (7) control of erosion by contour tillage, stripcropping, terracing, or construction of diversion ditches, and (8) timely tillage operations.

The estimates in table 2 are based primarily on (1) interviews with farmers, with the county agent, and with members of the Purdue University Agricultural Experiment Station; (2) on direct observations made by members of the soil survey party; and (3) on results obtained by the experiment station on experimental farms. The yields are estimates of average production over a period of about 10 years according to the two broadly defined types of management. The yields may not apply directly to any specific tract of land in any particular year, because management differs slightly from farm to farm and because climate fluctuates. Nevertheless, the estimates are as accurate as can be obtained without further detailed and lengthy investigation. Their main value is that they serve to bring out the relative productivity of the soils and indicate the increased yields that can be secured by using improved management.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines the soils in the field, classifies them in accordance with facts that he observes, maps their boundaries on an aerial photograph or other map, and describes them in his report.

Field study.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern but are located according to the lay of the land. Generally, they are not more than a quarter of a mile apart, and sometimes they are much closer. In most soils each boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile (fig. 2).

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. It is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger aggregates, or groups of grains, and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics, observed in the course of the field study and considered in classifying the soil, include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying parent material from which the soil has formed; surface and internal drainage; and acidity or alkalinity of the soil as measured by chemical tests.

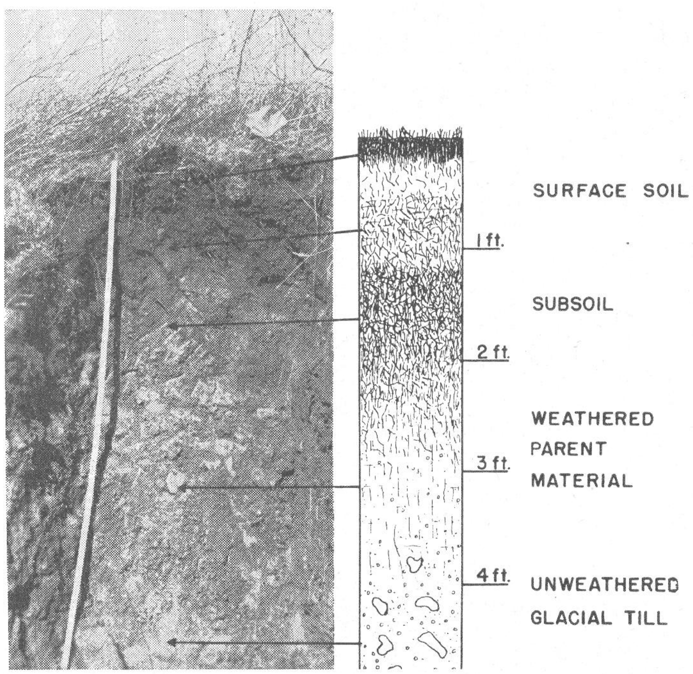

Figure 2.—**Photodiagram of a soil profile showing the different layers.**

TABLE 2.—*Estimated, long-term, average acre yields of principal crops under two levels of management*

[Absence of yield indicates soil is not suitable or that the crop ordinarily is not grown on the soil]

Soil [1]	Corn		Wheat		Oats		Soybeans		Mixed hay		Clover		Alfalfa	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Avonburg silt loam, 0 to 2 percent slopes:														
Drained	35	80	16	28	30	45	16	28	1. 0	2. 2	1. 4	2. 0	1. 0	2. 5
Undrained	20	----	7	----	10	----	10	----	. 6	----	----	----	----	----
Avonburg silt loam, 2 to 6 percent slopes, eroded	35	70	16	28	30	35	16	28	1. 0	2. 2	1. 4	2. 0	1. 5	2. 5
Birkbeck silt loam, 0 to 2 percent slopes	43	80	19	34	30	55	20	32	1. 1	2. 2	1. 3	2. 2	2. 4	4. 0
Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded	42	75	18	34	30	55	20	32	1. 0	2. 0	1. 2	2. 0	2. 2	3. 8
Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded	40	60	16	28	25	45	18	23	1. 0	1. 8	1. 1	1. 6	2. 0	3. 3
Brookston silty clay loam:														
Drained	65	90	20	30	35	60	25	34	2. 0	2. 5	1. 8	2. 0	2. 8	4. 0
Undrained	25	----	5	----	15	----	12	----	1. 6	----	1. 4	----	2. 0	----
Brookston silt loam:														
Drained	65	90	20	30	35	60	25	34	1. 8	2. 0	1. 8	2. 5	3. 8	4. 5
Undrained	30	----	10	----	15	----	12	----	1. 6	----	1. 5	----	2. 5	----
Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded	25	50	12	22	25	35	12	20	. 8	1. 5	. 7	1. 2	2. 4	3. 0
Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	20	40	10	17	20	30	10	15	. 7	1. 3	. 6	1. 0	2. 2	2. 8
Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded	20	30	10	17	20	27	10	15	. 5	. 8	. 6	1. 0	2. 0	2. 6
Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	18	30	8	14	18	25	9	12	. 5	. 8	. 6	1. 0	1. 2	2. 0
Cincinnati soils, 6 to 12 percent slopes, severely eroded	----	----	8	12	15	20	----	----	. 5	. 7	. 5	. 8	1. 0	1. 8
Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati soils, 12 to 18 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati soils, 18 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cincinnati silt loam, 25 to 45 percent slopes, eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cope silty clay loam:														
Drained	60	85	20	30	30	60	25	34	1. 8	2. 5	1. 6	2. 0	2. 8	3. 8
Undrained	25	----	5	----	15	----	12	----	1. 6	----	1. 4	----	2. 0	----
Cope silt loam:														
Drained	60	85	20	30	30	60	20	34	1. 8	2. 5	1. 6	2. 0	2. 8	3. 4
Undrained	25	----	5	----	15	----	12	----	1. 6	----	1. 4	----	2. 0	----
Crosby silt loam, 0 to 2 percent slopes:														
Drained	40	80	19	32	35	50	19	30	1. 6	2. 2	1. 4	2. 0	2. 4	3. 6
Undrained	30	----	10	----	25	----	12	----	1. 4	----	1. 0	----	1. 5	----
Crosby silt loam, 2 to 6 percent slopes, slightly eroded	35	70	19	32	35	50	18	30	1. 4	2. 2	1. 4	2. 0	2. 5	3. 5
Crosby silt loam, 2 to 6 percent slopes, moderately eroded	30	55	15	25	30	45	15	25	1. 2	2. 0	1. 0	1. 8	2. 0	3. 0
Delmar silt loam:														
Drained	30	50	15	28	30	40	15	28	1. 0	1. 8	1. 0	1. 6	2. 0	2. 8
Undrained	20	----	5	----	10	----	7	----	. 4	----	. 4	----	. 8	----
Eel silt loam:														
Drained and protected by levees	55	75	15	20	30	45	25	31	2. 2	2. 5	1. 8	2. 0	3. 0	3. 6
Undrained	40	----	----	----	----	----	20	----	1. 4	----	1. 4	----	----	----
Eel loam:														
Drained and protected by levees	45	60	15	20	35	45	25	31	2. 0	2. 5	1. 2	1. 5	2. 4	3. 5
Undrained	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fairmount silty clay loam, 2 to 6 percent slopes	25	45	12	25	15	30	17	30	1. 0	1. 5	1. 0	1. 0	2. 8	3. 5
Fairmount silty clay loam, 6 to 12 percent slopes	20	35	12	20	15	25	15	25	1. 0	1. 4	1. 0	1. 0	2. 5	3. 0
Fairmount silty clay loam, 12 to 18 percent slopes	----	----	10	15	----	----	----	----	----	----	----	----	2. 3	2. 8
Fairmount silty clay loam, 18 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fairmount silty clay loam, 25 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fairmount silty clay loam, 35 to 50 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fincastle silt loam, 0 to 2 percent slopes:														
Drained	40	80	19	32	35	50	19	30	1. 4	2. 2	1. 4	2. 0	2. 0	3. 5
Undrained	20	----	10	----	20	----	12	----	1. 2	----	. 8	----	----	----

See footnote at end of table.

TABLE 2.—*Estimated, long-term, average acre yields of principal crops under two levels of management*—Continued

Soil [1]	Corn		Wheat		Oats		Soybeans		Mixed hay		Clover		Alfalfa	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Fincastle silt loam, 2 to 6 percent slopes, slightly eroded:														
Drained	35	70	18	32	35	50	18	30	1.4	2.2	1.4	2.0	2.5	3.5
Fincastle silt loam, 2 to 6 percent slopes, moderately eroded:														
Drained	30	55	15	25	30	45	15	25	1.2	2.0	1.0	1.8	2.0	3.5
Fincastle and Crosby silt loams, 0 to 2 percent slopes:														
Drained	40	80	19	32	35	50	19	30	1.4	2.2	1.4	2.0	2.2	3.5
Undrained	20	----	10	----	20	----	12	----	1.2	----	.8	----	----	----
Fincastle and Crosby silt loams, 2 to 6 percent slopes	35	70	18	32	35	50	18	30	1.4	2.2	1.4	2.0	2.5	3.5
Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded	30	55	15	25	30	45	15	25	1.2	2.0	1.0	1.8	2.0	3.5
Fox loam, 0 to 2 percent slopes	35	45	18	33	25	35	20	28	1.0	1.3	.8	1.2	2.0	3.2
Fox loam, 2 to 6 percent slopes, slightly eroded	30	42	18	32	22	32	15	25	1.0	1.3	.8	1.2	2.0	2.8
Fox loam, 2 to 6 percent slopes, moderately eroded	25	35	13	25	20	30	12	18	.9	1.4	.9	1.2	1.8	2.8
Fox loam, 6 to 12 percent slopes, moderately eroded	20	30	12	14	18	20	10	15	.9	1.2	.9	1.0	1.8	2.8
Fox silt loam, 0 to 2 percent slopes	35	52	20	34	25	35	17	23	1.2	1.6	1.2	1.6	3.2	3.8
Fox silt loam, 2 to 6 percent slopes, slightly eroded	35	47	20	33	25	35	17	23	1.2	1.6	1.2	1.6	3.2	3.8
Fox silt loam, 2 to 6 percent slopes, moderately eroded	30	40	16	25	20	25	15	20	1.0	1.3	1.0	1.6	3.0	3.4
Fox silt loam, 6 to 12 percent slopes, moderately eroded	25	35	12	15	20	25	12	16	.9	1.3	.9	1.6	2.0	2.5
Fox soils, 6 to 12 percent slopes, severely eroded	10	18	8	12	----	----	----	----	.4	.8	----	----	1.4	2.2
Fox silt loam, 12 to 18 percent slopes, slightly eroded	----	----	10	14	----	----	----	----	----	----	----	----	1.6	2.0
Fox silt loam, 12 to 18 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	.8	2.2
Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded	25	35	12	20	20	30	12	16	.9	1.4	.9	1.2	1.8	2.8
Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded	20	30	12	14	18	25	12	15	.9	1.2	.9	1.0	1.8	2.8
Fox soils, kames, 6 to 12 percent slopes, severely eroded	----	----	6	10	----	----	----	----	----	----	----	----	1.5	2.5
Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded	25	30	12	14	18	28	12	15	.9	1.2	.9	1.0	1.8	2.8
Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded	----	----	5	8	----	----	----	----	----	----	----	----	.7	1.6
Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded	----	----	6	10	----	----	----	----	----	----	----	----	.7	1.8
Fox and Rodman soils, 12 to 18 percent slopes, severely eroded	----	----	5	8	----	----	----	----	----	----	----	----	.7	1.6
Genesee silt loam	60	80	12	20	20	25	20	30	1.2	1.6	1.2	1.0	2.5	3.0
Genesee silt loam, high bottom	55	75	20	25	30	40	20	30	1.2	1.6	1.0	1.4	2.5	3.3
Genesee loam	50	75	14	20	20	35	20	30	1.6	2.3	1.2	1.6	3.0	3.5
Genesee loam, high bottom	50	70	20	25	30	40	20	30	1.8	1.6	1.5	2.2	2.5	3.3
Genesee gravelly loam	35	50	18	22	15	30	17	28	1.3	1.7	1.0	1.2	3.0	3.5
Genesee fine sandy loam	35	50	13	18	15	30	17	28	1.3	1.7	.7	1.0	2.8	3.8
Hennepin loam, 25 to 35 percent slopes, slightly eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hennepin loam, 25 to 35 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hennepin loam, 35 to 50 percent slopes, slightly eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hennepin loam, 35 to 50 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Homer silt loam:														
Drained	38	65	18	30	35	50	18	30	1.4	1.8	1.4	2.0	2.5	3.5
Undrained	20	----	----	----	----	----	15	----	.8	----	1.0	----	----	----
Kokomo silty clay loam:														
Drained	45	80	20	28	30	50	20	30	1.8	2.0	1.0	1.5	2.0	3.2
Undrained	20	----	5	----	10	----	10	----	1.0	----	1.7	----	----	----
Manlove silt loam, 0 to 2 percent slopes	45	80	20	34	30	55	20	32	1.0	2.0	1.2	2.2	2.4	4.0
Manlove silt loam, 2 to 6 percent slopes, slightly eroded	42	75	20	34	30	55	20	32	1.0	2.0	1.2	2.0	2.2	3.8
Manlove silt loam, 2 to 6 percent slopes, moderately eroded	40	60	17	28	25	45	18	23	1.0	1.8	1.0	1.6	2.0	3.3
Martinsville silt loam, 0 to 2 percent slopes	40	80	20	34	26	38	18	22	1.6	2.0	1.4	2.0	3.0	3.7

See footnote at end of table.

Table 2.—*Estimated, long-term, average acre yields of principal crops under two levels of management*—Continued

Soil [1]	Corn		Wheat		Oats		Soybeans		Mixed hay		Clover		Alfalfa	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Martinsville silt loam, 2 to 6 percent slopes, slightly eroded	58	75	20	30	25	35	17	20	1.4	1.8	1.2	1.8	2.8	3.5
Martinsville silt loam, 2 to 6 percent slopes, moderately eroded	28	50	18	25	23	30	14	18	1.3	1.7	1.1	1.5	2.8	3.4
Martinsville silt loam, 6 to 12 percent slopes, moderately eroded	28	35	18	22	23	30	14	18	1.3	1.7	1.1	1.5	2.8	3.4
Martinsville silt loam, 12 to 18 percent slopes, moderately eroded	---	---	14	20	---	---	---	---	1.0	1.5	---	---	2.2	3.0
Miami silt loam, 0 to 2 percent slopes	40	75	20	34	30	55	20	33	1.2	2.2	1.0	2.2	2.6	4.0
Miami silt loam, 2 to 6 percent slopes, slightly eroded	42	70	19	32	28	50	18	23	1.2	2.2	1.2	2.0	3.0	3.6
Miami silt loam, 2 to 6 percent slopes, moderately eroded	40	50	16	27	25	40	16	22	1.1	1.5	.9	1.5	2.0	3.4
Miami silt loam, 6 to 12 percent slopes, slightly eroded	27	40	15	23	22	30	---	---	1.0	1.5	.9	1.6	1.8	3.2
Miami silt loam, 6 to 12 percent slopes, moderately eroded	20	30	14	20	18	25	---	---	.8	1.4	.8	1.4	1.8	2.8
Miami silt loam, 12 to 18 percent slopes, slightly eroded	20	27	13	20	---	---	---	---	.7	1.3	.7	1.3	1.3	2.0
Miami silt loam, 12 to 18 percent slopes, moderately eroded	15	22	12	18	---	---	---	---	.7	1.2	.6	1.0	1.2	1.8
Miami silt loam, 18 to 25 percent slopes, slightly eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Miami silt loam, 18 to 25 percent slopes, moderately eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Miami soils, 2 to 6 percent slopes, severely eroded	23	33	10	14	15	22	---	---	.8	1.1	.6	1.9	1.7	2.5
Miami soils, 6 to 12 percent slopes, severely eroded	20	25	13	20	15	25	---	---	.7	.9	.5	.8	1.3	2.0
Miami soils, 12 to 18 percent slopes, severely eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Miami soils, 18 to 25 percent slopes, severely eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Milton silt loam, 2 to 6 percent slopes, slightly eroded	45	60	18	30	25	40	20	28	1.2	2.2	1.0	2.0	3.0	3.8
Milton silt loam, 2 to 6 percent slopes, moderately eroded	30	55	16	23	23	33	16	24	1.7	1.9	1.1	1.7	2.0	2.5
Nineveh loam	20	40	21	29	20	30	20	30	1.0	1.4	1.0	1.4	2.0	3.4
Ockley silt loam, 0 to 2 percent slopes	40	55	20	34	30	45	20	30	1.3	2.0	1.3	1.8	2.4	3.6
Ockley silt loam, 2 to 6 percent slopes, slightly eroded	40	55	20	34	30	45	20	30	1.3	1.9	1.3	1.8	2.4	3.6
Ockley silt loam, 2 to 6 percent slopes, moderately eroded	30	45	16	27	22	40	15	25	1.0	1.6	1.1	1.5	2.0	3.4
Ockley soils, 2 to 6 percent slopes, severely eroded	20	35	12	20	15	30	14	22	1.0	1.4	1.0	1.3	1.8	3.0
Ockley silt loam, 6 to 12 percent slopes, moderately eroded	20	30	14	20	18	25	15	22	.9	1.2	.6	1.0	1.6	2.6
Ockley soils, 6 to 12 percent slopes, severely eroded	12	30	10	15	15	22	10	15	.6	1.0	.6	1.0	1.2	2.4
Reesville silt loam, 0 to 2 percent slopes:														
Drained	40	80	19	32	35	50	19	30	1.4	2.2	1.4	2.0	2.3	3.7
Undrained	20	---	10	---	20	---	12	---	1.2	---	.8	---	---	---
Reesville silt loam, 0 to 2 percent slopes, moderately eroded:														
Drained	40	78	19	32	35	45	19	30	1.4	2.2	1.4	2.0	2.5	3.7
Undrained	25	---	12	---	20	---	---	---	1.2	---	---	---	---	---
Reesville silt loam, 2 to 6 percent slopes, moderately eroded	35	60	15	25	30	42	15	25	1.2	2.0	1.0	1.8	2.0	3.5
Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded	---	---	6	10	---	---	---	---	---	---	---	---	.7	1.8
Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Rodman gravelly loam, 25 to 50 percent slopes, eroded	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ross silt loam	50	65	20	30	32	55	20	30	1.8	2.0	1.8	2.0	3.3	4.4
Russell silt loam, 0 to 2 percent slopes	45	75	20	34	30	55	20	33	1.2	2.2	1.2	2.0	2.4	4.0
Russell silt loam, 2 to 6 percent slopes, slightly eroded	42	70	19	32	28	35	18	30	1.2	2.2	1.2	2.0	2.2	4.0
Russell silt loam, 2 to 6 percent slopes, moderately eroded	38	50	16	25	25	40	16	24	1.2	4.6	1.1	1.6	1.8	3.4
Russell soils, 2 to 6 percent slopes, severely eroded	23	37	11	16	15	20	---	---	.8	1.1	.6	1.9	1.6	2.8
Russell silt loam, 6 to 12 percent slopes, slightly eroded	27	40	15	23	22	30	15	22	1.0	1.5	1.0	1.6	1.7	3.2

See footnote at end of table.

TABLE 2.—*Estimated, long-term, average acre yields of principal crops under two levels of management*—Continued

Soil [1]	Corn		Wheat		Oats		Soybeans		Mixed hay		Clover		Alfalfa	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Russell silt loam, 6 to 12 percent slopes, moderately eroded	28	30	14	20	18	28	12	17	0.8	1.4	0.9	1.2	1.6	2.5
Russell soils, 6 to 12 percent slopes, severely eroded	15	22	8	12	15	25	----	----	.6	.8	.3	.7	1.0	1.8
Russell silt loam, 12 to 18 percent slopes, slightly eroded	22	27	10	15	15	25	----	----	.7	1.2	.7	1.2	1.4	2.0
Russell silt loam, 12 to 18 percent slopes, moderately eroded	15	22	9	12	14	22	----	----	.7	1.1	.7	1.2	1.4	2.0
Russell soils, 12 to 18 percent slopes, severely eroded	13	20	8	12	----	----	----	----	.6	1.0	.6	1.0	1.4	1.8
Russell silt loam, 18 to 25 percent slopes, slightly eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Russell silt loam, 18 to 25 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Russell soils, 18 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Russell and Miami silt loams, 0 to 2 percent slopes	45	75	29	34	30	55	19	33	1.2	2.2	1.2	2.0	2.4	4.0
Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded	42	70	19	32	28	50	18	30	1.2	2.2	1.2	2.0	2.2	4.0
Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded	38	50	16	25	25	40	16	24	1.2	4.6	1.0	1.6	1.8	3.4
Russell and Miami soils, 2 to 6 percent slopes, severely eroded	23	37	14	20	15	22	----	----	.8	1.1	.6	.9	1.6	2.8
Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded	27	40	15	23	22	30	15	22	1.0	1.5	1.0	1.6	1.7	3.2
Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded	28	30	14	20	18	28	12	17	.8	1.4	.9	1.2	1.6	2.5
Russell and Miami soils, 6 to 12 percent slopes, severely eroded	15	22	8	12	15	25	----	----	.6	.8	.3	1.7	1.0	1.8
Shoals silt loam:														
Drained	40	60	10	15	20	35	20	30	1.0	1.8	----	1.5	2.0	3.0
Undrained	15	----	----	----	----	----	----	----	.5	----	----	----	----	----
Sloan silt loam:														
Drained	45	65	13	22	30	50	20	30	1.8	2.5	1.0	1.7	2.0	3.0
Undrained	15	----	----	----	----	----	10	----	1.0	----	----	----	----	----
Westland silt loam:														
Drained	55	90	20	30	30	55	20	30	1.8	2.5	1.3	2.2	2.8	4.2
Undrained	28	----	----	----	15	----	15	----	1.4	----	1.2	----	----	----
Whitaker silt loam, 0 to 2 percent slopes	40	80	18	32	30	50	19	30	1.4	2.2	1.2	2.0	2.5	3.5
Whitaker silt loam, 2 to 6 percent slopes	40	75	19	32	35	50	19	30	1.4	2.2	1.4	2.0	2.5	3.5
Wynn silt loam, 2 to 6 percent slopes, slightly eroded	35	50	17	25	35	45	17	22	1.8	2.2	1.2	1.8	2.4	3.6
Wynn silt loam, 2 to 6 percent slopes, moderately eroded	30	45	15	20	22	30	12	17	1.4	1.8	.8	1.4	1.8	2.8
Wynn silt loam, 6 to 12 percent slopes, moderately eroded	25	37	10	25	20	27	10	15	1.0	1.5	.6	1.2	1.5	2.5
Wynn silt loam, 12 to 25 percent slopes, moderately eroded	----	----	10	15	----	----	----	----	1.0	1.5	.6	1.2	1.5	2.5
Wynn soils, 6 to 12 percent slopes, severely eroded	20	30	8	12	17	25	8	12	.6	1.0	.4	1.0	1.2	2.0
Xenia silt loam, 0 to 2 percent slopes	45	80	19	32	28	55	18	28	1.2	1.6	1.2	1.6	2.0	4.0
Xenia silt loam, 2 to 6 percent slopes, slightly eroded	40	75	18	32	26	55	16	26	1.0	1.5	1.0	1.6	2.0	3.8
Xenia silt loam, 2 to 6 percent slopes, moderately eroded	38	55	16	25	20	45	15	----	1.0	1.5	1.0	1.5	1.8	3.2
Xenia and Celina silt loams, 0 to 2 percent slopes	45	80	17	32	28	55	18	28	1.2	1.6	1.2	1.6	2.4	4.0
Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded	40	75	16	32	26	55	16	26	1.0	1.5	1.0	1.6	2.2	3.8
Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded	38	55	15	25	20	45	15	----	1.0	1.5	1.0	1.5	2.0	3.2

[1] The terms "drained" and "undrained" refer to artificial drainage.

Classification.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified by series, types, and phases.

Soil series.—Two or more soil types that differ in texture of the surface layer but that are otherwise similar in kind, thickness, and arrangement of soil layers are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which it was first mapped.

Soil type.—Soils having the same texture in the surface layer and similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variation, frequency of rock outcrop, degree of erosion, depth of soil over the substratum, or natural drainage, are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices, therefore, can be specified more easily than for soil series or yet broader groups that contain more variation.

Miscellaneous land types.—Areas that have little true soil are not classified by types and series. Instead, they are identified by descriptive names, such as Borrow pits, Gravel pits, or Made land.

Undifferentiated soils.—Two or more soils that are not regularly associated geographically may be mapped as an undifferentiated soil group—a single unit—if the differences between them are too slight to justify a separation. Examples are Fincastle and Crosby silt loams, and Fox and Rodman loams.

Definitions.—Most of the terms scientists use in describing soils are familiar, but they may have special meanings in soil science. Some of the words used in this report and the terms used in the tables are defined as follows:

Acidity is the reaction of the soil mass expressed in pH values, or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Catena is the term for a group of soils formed from similar parent materials but with unlike characteristics because of differences in drainage.

Erosion is the wearing away or removal of soil material by water or wind. Terms used to describe erosion are *none, slight, moderate, severe,* and *very severe.*

Internal drainage is that quality of the soil that permits the downward flow of excess water through it.

Moisture-supplying capacity, or the ability of the soils to supply moisture to plants, is described in this report as *very low, low, medium, high,* or *very high.*

Parent material is the unconsolidated material, such as sand, silt, clay, or decomposed bedrock, from which the soil profile develops.

Permeability is that quality of the soil that enables it to transmit water or air. The terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Slope is the amount of rise, in feet, for each 100 feet of horizontal distance.

Surface runoff refers to the amount of water removed by flow over the surface of the soil. The terms used to describe runoff are *ponded, very slow, slow, medium, rapid,* and *very rapid.*

Topography refers to the shape of the ground surface, such as hills, mountains, or plains. Steep topography indicates steep slopes or hilly land; flat topography indicates flat land with minor undulations and gentle slopes.

General Soil Map

Some of the soils in Fayette and Union Counties are on uplands. Others are on river terraces or in the former channels of glaciers. Still others are on flood plains. The soils appear in a recurring geographic pattern. Of the upland soils, for example, the Miami and Crosby soils occur along drainageways and on low knolls on the nearly level divides.

Figure 3 shows the broad general areas in Fayette and Union Counties. A similar map, in color, is in the back of the report.

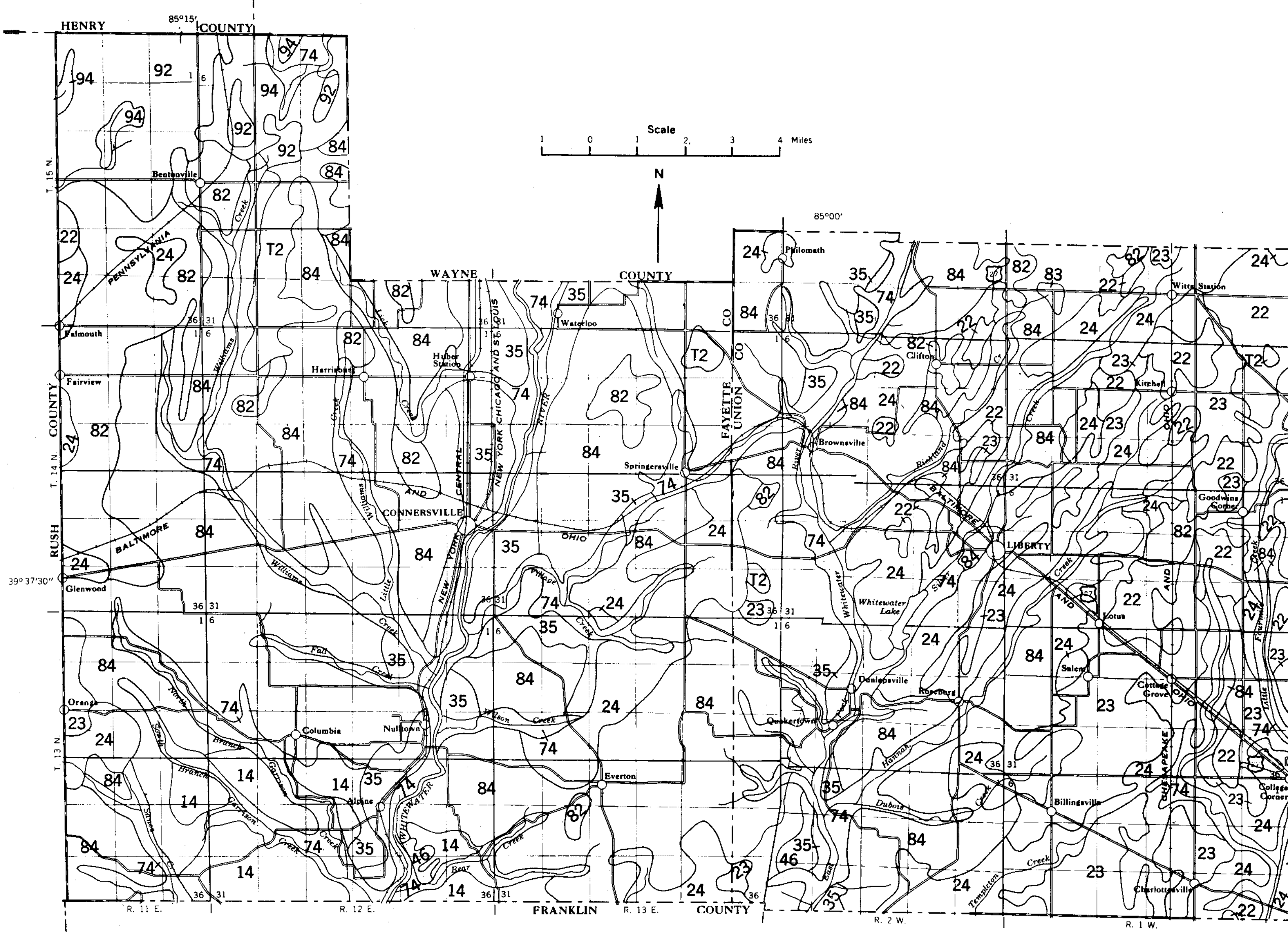

Figure 3.—**General soil map of Fayette and Union Counties; legend on facing page.**

Soils of the uplands—

Dominantly well drained soils in silt that overlies till of Wisconsin age; moderately leached:

94. Dominantly grayish brown soils in less than 18 inches of silt over till; calcareous at depths of 13 to 42 inches.
Miami silt loam, on sloping areas along drainageways and on low knolls on the nearly level divides.
Crosby silt loam, light colored and somewhat poorly drained.
Brookston silt loam, dark colored and very poorly drained.

84. Dominantly grayish brown soils in 18 to 36 inches of silt over loamy till; calcareous at depths of 42 to about 70 inches.
Russell silt loam, on sloping to moderately steep areas along drainageways.
Hennepin loam, dark brown and steeply sloping.
Fairmount silty clay loam.
Xenia silt loam, gently sloping and moderately well drained.
Fincastle silt loam, light colored, level, and somewhat poorly drained.
Cope silt loam and Brookston silty clay loam, dark colored and in depressions; poorly drained.

24. Grayish-brown soils in variable, but thin, silt over loamy till; calcareous at depths of 30 to 34 inches.
Russell and Miami silt loams, sloping areas along drainageways and on low knolls on the divides.
Xenia and Celina silt loams, gently sloping and moderately well drained.
Fincastle and Crosby silt loams, nearly level and somewhat poorly drained.

Dominantly well drained soils in silt that overlies till of Illinoian age; strongly leached:

14. Grayish-brown soils in silt over loamy till; calcareous at depths of 10 or more feet.
Cincinnati silt loam, on rolling, dissected ridgetops and on the steep hillsides of deep valleys; strongly acid.
Avonburg silt loam, nearly level and somewhat poorly drained.

Dominantly well drained soils in silt on thin deposits of glacial till over limestone of Ordovician period:

46. Dominantly dark brown soils formed largely in materials from limestone and clay shale; neutral and on steep slopes.
Fairmount silty clay loam.
Cincinnati silt loam, grayish brown.
Russell silt loam, grayish brown.
Wynn silt loam, grayish brown.

Dominantly moderately well drained soils in silt that overlies loamy till:

83. Dominantly grayish brown soils in 18 to 36 inches of silt over loamy till; calcareous at depths of 42 to about 70 inches.
Xenia silt loam, on gentle slopes near heads of drainageways and on low knolls on the till plain.
Russell silt loam, more sloping than Xenia silt loam.
Cope silt loam and silty clay loam, moderately dark colored and in depressions; poorly drained.
Brookston silt loam and silty clay loam, dark colored and in depressions; poorly drained.

23. Dominantly grayish brown soils in variable, but thin, silt over loamy till; calcareous at depths of 24 to 42 inches.
Xenia and Celina silt loams on gently sloping areas near heads of drainageways and on low knolls on the divides.
Russell and Miami silt loams, more sloping than Xenia and Celina silt loams.
Fincastle and Crosby silt loams, nearly level and somewhat poorly drained.
Cope silt loam and silty clay loam, moderately dark colored and in depressions; poorly drained.
Brookston silt loam and silty clay loam, dark colored and in depressions; poorly drained.

Dominantly somewhat poorly drained soils in silt over till of Wisconsin age; moderately leached:

92. Pattern of light and dark soils in less than 18 inches of silt over till; calcareous at depths of 12 to 42 inches.
Crosby silt loam, brownish gray and nearly level to slightly elevated.
Brookston silty clay loam, dark colored and in swales and depressions.
Miami silt loam, on gently sloping knolls and near drainageways; better drained than Crosby and Brookston soils.

82. Dominantly brownish gray soils in 18 to 36 inches of silt over till; calcareous at depths of 42 to 70 inches.
Fincastle silt loam, on slightly elevated areas.
Brookston silt loam and silty clay loam, dark colored and in swales and depressions.
Cope silt loam and silty clay loam, moderately dark colored and in swales and depressions.
Reesville silt loam, more silty than Fincastle, Brookston, and Cope soils.
Xenia silt loam, better drained than Fincastle, Brookston, and Cope soils.
Russell silt loam, better drained than Fincastle, Brookston, and Cope soils.

22. Dominantly brownish gray soils in thin silt over loamy till; calcareous at depths of 24 to 42 inches.
Fincastle and Crosby silt loams, on slightly elevated areas.
Cope silt loam and silty clay loam, dark colored and in swales and depressions.
Brookston silt loam and silty clay loam, dark colored and in swales and depressions.
Russell and Miami silt loams, better drained and on slightly higher, more sloping areas than other soils in the group.

T2. Dominantly grayish brown, neutral to calcareous soils in 3 to 5 feet or more of silt, over highly calcareous loamy till.
Reesville silt loam, on slightly elevated areas.
Birkbeck silt loam, on slightly elevated areas.
Brookston silt loam and silty clay loam, dark colored and in swales and depressions.
Cope silt loam and silty clay loam, dark colored and in swales and depressions.
Manlove silt loam, near drainageways; more sloping than other soils of the group.

Soils of the river terraces and former glacial channels—

Dominantly well drained to excessively drained soils in silty and loamy materials over stratified gravel and sand:

35. Dominantly pale brown soils in silty and loamy materials over stratified gravel and sand; calcareous at depths of 24 to about 42 inches:
Fox silt loam, on level to sloping areas.
Ockley silt loam.
Rodman gravelly loam, dark colored; on steep slopes and thinner than the Fox and Ockley soils.
Homer silt loam, brownish gray and somewhat poorly drained.
Westland silt loam, dark gray and in level areas in swales and depressions; very poorly drained.
Martinsville silt loam, in silt and sand and well drained.

Soils of the flood plains—

Predominantly well drained soils formed in materials deposited during stream overflow:

74. Grayish-brown soils in neutral to slightly calcareous materials.
Genesee silt loam, loam, and fine sandy loam in level areas.
Eel silt loam and loam, moderately well drained.
Shoals silt loam, on small stream bottoms and old meander channels of larger streams; somewhat poorly drained.

Soil Series and Mapping Units

In the following pages the soil series of Fayette and Union Counties are described in alphabetical order. Following the description of a soil typical of the series, the mapping units in that series are listed and described. Unless otherwise indicated the colors given in the descriptions are for moist soils. The descriptions of the surface soil refer to the combined A horizons.

Table 3 gives the approximate acreage and the proportionate extent of the soils. The location of each is shown on the soil map at the back of this report.

TABLE 3.—*Approximate acreage and proportionate extent of soils mapped*

Soil	Acres	Percent
Avonburg silt loam, 0 to 2 percent slopes	30	[1]
Avonburg silt loam, 2 to 6 percent slopes, eroded	60	[1]
Birkbeck silt loam, 0 to 2 percent slopes	1, 350	0. 6
Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded	60	[1]
Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded	300	. 1
Borrow pits	40	[1]
Brookston silty clay loam	3, 270	1. 3
Brookston silt loam	8, 350	3. 4
Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded	170	. 1
Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	800	. 3
Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded	400	. 2
Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	1, 150	. 5
Cincinnati soils, 6 to 12 percent slopes, severely eroded	370	. 2
Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded	340	. 1
Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	640	. 3
Cincinnati soils, 12 to 18 percent slopes, severely eroded	710	. 3
Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded	540	. 2
Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded	340	. 1
Cincinnati soils, 18 to 25 percent slopes, severely eroded	340	. 1
Cincinnati silt loam, 25 to 45 percent slopes, eroded	3, 050	1. 2
Cope silty clay loam	4, 100	1. 7
Cope silt loam	3, 100	1. 3
Crosby silt loam, 0 to 2 percent slopes	3, 950	1. 6
Crosby silt loam, 2 to 6 percent slopes, slightly eroded	900	. 4
Crosby silt loam, 2 to 6 percent slopes, moderately eroded	860	. 4
Delmar silt loam	60	[1]
Eel silt loam	10, 300	4. 2
Eel loam	1, 000	. 4
Fairmount silty clay loam, 2 to 6 percent slopes	30	[1]
Fairmount silty clay loam, 6 to 12 percent slopes	100	[1]
Fairmount silty clay loam, 12 to 18 percent slopes	80	[1]
Fairmount silty clay loam, 18 to 25 percent slopes	400	. 2
Fairmount silty clay loam, 25 to 35 percent slopes	560	. 2
Fairmount silty clay loam, 35 to 50 percent slopes	900	. 4
Fincastle silt loam, 0 to 2 percent slopes	7, 450	3. 0
Fincastle silt loam, 2 to 6 percent slopes, slightly eroded	450	. 2
Fincastle silt loam, 2 to 6 percent slopes, moderately eroded	290	. 1
Fincastle and Crosby silt loams, 0 to 2 percent slopes	7, 450	3. 0
Fincastle and Crosby silt loams, 2 to 6 percent slopes	190	0. 1
Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded	290	. 1
Fox loam, 0 to 2 percent slopes	1, 760	. 7
Fox loam, 2 to 6 percent slopes, slightly eroded	200	. 1
Fox loam, 2 to 6 percent slopes, moderately eroded	450	. 2
Fox loam, 6 to 12 percent slopes, moderately eroded	90	[1]
Fox silt loam, 0 to 2 percent slopes	2, 820	1. 2
Fox silt loam, 2 to 6 percent slopes, slightly eroded	550	. 2
Fox silt loam, 2 to 6 percent slopes, moderately eroded	500	. 2
Fox silt loam, 6 to 12 percent slopes, moderately eroded	170	. 1
Fox soils, 6 to 12 percent slopes, severely eroded	180	. 1
Fox silt loam, 12 to 18 percent slopes, slightly eroded	30	[1]
Fox silt loam, 12 to 18 percent slopes, moderately eroded	150	. 1
Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded	300	. 1
Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded	240	. 1
Fox soils, kames, 6 to 12 percent slopes, severely eroded	260	. 1
Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded	100	[1]
Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded	100	[1]
Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded	50	[1]
Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded	70	[1]
Fox and Rodman soils, 12 to 18 percent slopes, severely eroded	190	. 1
Genesee silt loam	5, 300	2. 2
Genesee silt loam, high bottom	1, 470	. 6
Genesee loam	7, 340	3. 0
Genesee loam, high bottom	790	. 3
Genesee gravelly loam	150	. 1
Genesee fine sandy loam	80	[1]
Gravel pits	70	[1]
Hennepin loam, 25 to 35 percent slopes, slightly eroded	6, 770	2. 8
Hennepin loam, 25 to 35 percent slopes, moderately eroded	800	. 3
Hennepin loam, 35 to 50 percent slopes, slightly eroded	1, 980	. 8
Hennepin loam, 35 to 50 percent slopes, moderately eroded	110	[1]
Homer silt loam	280	. 1
Kokomo silty clay loam	70	[1]
Lake beach	10	[1]
Made land	70	[1]
Manlove silt loam, 0 to 2 percent slopes	1, 240	. 5
Manlove silt loam, 2 to 6 percent slopes, slightly eroded	300	. 1
Manlove silt loam, 2 to 6 percent slopes, moderately eroded	130	. 1
Martinsville silt loam, 0 to 2 percent slopes	210	. 1

See footnote at end of table.

TABLE 3.—*Approximate acreage and proportionate extent of soils mapped*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Martinsville silt loam, 2 to 6 percent slopes, slightly eroded	210	0.1	Russell silt loam, 2 to 6 percent slopes, slightly eroded	14,890	6.2
Martinsville silt loam, 2 to 6 percent slopes, moderately eroded	180	.1	Russell silt loam, 2 to 6 percent slopes, moderately eroded	28,550	11.8
Martinsville silt loam, 6 to 12 percent slopes, moderately eroded	30	(1)	Russell soils, 2 to 6 percent slopes, severely eroded	1,100	.4
Martinsville silt loam, 12 to 18 percent slopes, moderately eroded	60	(1)	Russell silt loam, 6 to 12 percent slopes, slightly eroded	1,200	.5
Miami silt loam, 0 to 2 percent slopes	70	(1)	Russell silt loam, 6 to 12 percent slopes, moderately eroded	6,800	2.8
Miami silt loam, 2 to 6 percent slopes, slightly eroded	340	.1	Russell soils, 6 to 12 percent slopes, severely eroded	13,900	5.7
Miami silt loam, 2 to 6 percent slopes, moderately eroded	1,700	.7	Russell silt loam, 12 to 18 percent slopes, slightly eroded	1,920	.8
Miami silt loam, 6 to 12 percent slopes, slightly eroded	90	(1)	Russell silt loam, 12 to 18 percent slopes, moderately eroded	2,940	1.2
Miami silt loam, 6 to 12 percent slopes, moderately eroded	560	.2	Russell soils, 12 to 18 percent slopes, severely eroded	4,180	1.7
Miami silt loam, 12 to 18 percent slopes, slightly eroded	500	.2	Russell silt loam, 18 to 25 percent slopes, slightly eroded	2,710	1.1
Miami silt loam, 12 to 18 percent slopes, moderately eroded	730	.3	Russell silt loam, 18 to 25 percent slopes, moderately eroded	1,520	.6
Miami silt loam, 18 to 25 percent slopes, slightly eroded	620	.3	Russell soils, 18 to 25 percent slopes, severely eroded	960	.4
Miami silt loam, 18 to 25 percent slopes, moderately eroded	310	.1	Russell and Miami silt loams, 0 to 2 percent slopes	1,150	.5
Miami soils, 2 to 6 percent slopes, severely eroded	70	(1)	Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded	4,500	1.8
Miami soils, 6 to 12 percent slopes, severely eroded	600	.2	Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded	7,100	3.0
Miami soils, 12 to 18 percent slopes, severely eroded	900	.4	Russell and Miami soils, 2 to 6 percent slopes, severely eroded	560	.2
Miami soils, 18 to 25 percent slopes, severely eroded	230	.1	Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded	560	.2
Milton silt loam, 2 to 6 percent slopes, slightly eroded	50	(1)	Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded	1,000	4.0
Milton silt loam, 2 to 6 percent slopes, moderately eroded	40	(1)	Russell and Miami soils, 6 to 12 percent slopes, severely eroded	3,050	1.2
Nineveh loam	420	.2	Shoals silt loam	80	(1)
Ockley silt loam, 0 to 2 percent slopes	5,300	2.2	Sloan silt loam	170	.1
Ockley silt loam, 2 to 6 percent slopes, slightly eroded	750	.3	Westland silt loam	680	.3
Ockley silt loam, 2 to 6 percent slopes, moderately eroded	1,000	.4	Whitaker silt loam, 0 to 2 percent slopes	450	.2
Ockley soils, 2 to 6 percent slopes, severely eroded	20	(1)	Whitaker silt loam, 2 to 6 percent slopes	70	(1)
Ockley silt loam, 6 to 12 percent slopes, moderately eroded	100	(1)	Wynn silt loam, 2 to 6 percent slopes, slightly eroded	110	(1)
Ockley soils, 6 to 12 percent slopes, severely eroded	140	.1	Wynn silt loam, 2 to 6 percent slopes, moderately eroded	90	(1)
Reesville silt loam, 0 to 2 percent slopes	3,200	1.3	Wynn silt loam, 6 to 12 percent slopes, moderately eroded	110	(1)
Reesville silt loam, 0 to 2 percent slopes, moderately eroded	100	(1)	Wynn silt loam, 12 to 25 percent slopes, moderately eroded	110	(1)
Reesville silt loam, 2 to 6 percent slopes, moderately eroded	40	(1)	Wynn soils, 6 to 12 percent slopes, severely eroded	170	.1
Riverwash	180	.1	Xenia silt loam, 0 to 2 percent slopes	3,830	1.6
Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded	70	(1)	Xenia silt loam, 2 to 6 percent slopes, slightly eroded	1,360	.6
Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded	190	.1	Xenia silt loam, 2 to 6 percent slopes, moderately eroded	1,400	.6
Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded	130	.1	Xenia and Celina silt loams, 0 to 2 percent slopes, eroded	12,600	5.1
Rodman gravelly loam, 25 to 50 percent slopes, eroded	1,070	.4	Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded	530	.2
Ross silt loam	120	(1)	Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded	1,130	.5
Russell silt loam, 0 to 2 percent slopes	3,610	1.5	Total	245,120	100.0

[1] Less than 0.1 percent.

Avonburg Series

The soils of the Avonburg series are light colored and are nearly level and somewhat poorly drained. They occur on uplands on the Illinoian till plain. The soils have formed under forest in a layer of windblown silt, or loess, 30 to 50 inches thick, that is underlain by glacial till of loam to coarse-textured clay loam. The native vegetation consisted of pin oak, sweetgum, and other water-tolerant hardwoods.

These soils are in the same catena as the Cincinnati soils, which are well drained. They generally have a firm, brittle pan in the lower part of the B horizon and limy till at depths of 10 feet or more. The Avonburg soils are Planosols.

Profile of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated area:

A_p 0 to 7 inches, dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; low content of organic matter; slightly acid to medium acid; abrupt, smooth lower boundary.

A_2 7 to 12 inches, light brownish-gray (10YR 6/2) silt loam; a few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, thin, platy structure to medium, granular structure; low content of organic matter; medium acid to strongly acid.

B_1 12 to 30 inches, yellowish-brown (10YR 5/4), light silty clay loam; many, medium, distinct mottles of gray (10YR 6/1) to light gray (10YR 7/1); strong, medium, subangular blocky structure; firm when moist, hard when dry, and plastic when wet; strongly acid.

B_{21m} 30 to 60 inches, yellowish-brown (10YR 5/6), light silty clay loam; common, medium, distinct mottles of pale brown (10YR 6/3) and light gray (10YR 7/2); moderate, medium, prismatic structure to blocky structure; the peds are capped and the cracks are coated with light-gray silt; firm when moist, hard when dry, and plastic when wet; very strongly acid.

C_1 60 to 120 inches, yellowish-brown (10YR 5/6), gritty silty clay loam to clay loam mottled with light gray (10YR 7/2); contains some grit and pebbles that increase in number with increasing depth; strongly acid in the upper part to slightly acid near the parent material.

C_2 120 inches +, light yellowish-brown (10YR 6/4) till of calcareous loam to light clay loam.

The color of the surface soil ranges from dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2). The texture of the subsoil ranges from silt loam to silty clay loam. In most places there are a few iron and manganese concretions. Generally, the solum is thinner on the slopes than in the nearly level areas.

Avonburg silt loam, 0 to 2 percent slopes (AvA).—The profile of this soil is the same as the profile described for the series. The soil occurs in a few small areas in the south-central part of Fayette County.

The use of this soil is limited by the somewhat poor drainage. In addition, the soil is strongly acid and is low in plant nutrients. The drainage can be improved by tile drains. Surface drainage can be provided by bedding or by plowing in narrow bands, the dead furrows serving as drainageways. To obtain good yields, apply lime and fertilizer in amounts determined by soil tests. Use a cropping system that will help to increase the supply of plant nutrients in the soil and that will help to maintain the content of organic matter. (Management group 5C.)

Avonburg silt loam, 2 to 6 percent slopes, eroded (AvB2).—This soil has a profile similar to that described for the series, but it is more eroded and has a thinner surface layer. This soil is on interstream divides in the south-central part of Fayette County.

The surface layer ranges from 3 to 8 inches in thickness. In places the subsoil has been exposed by tillage. Here, the present surface layer is mixed pale yellow and gray, has a lower content of organic matter than normal, and tends to puddle or run together. Internal drainage is slow, but enough surface water runs off so that the soil soon dries for tillage.

If the soil is used for row crops, tillage should be on the contour. In some places grass waterways are needed to carry off excess surface water. The longer slopes need diversion terraces. Because of the risk of erosion, this soil is generally cropped less intensively than Avonburg silt loam, 0 to 2 percent slopes. Surface drainage is more effective, however, on this soil. The cropping system should include more meadow crops than row crops. (Management group 5D.)

Birkbeck Series

The Birkbeck series consists of nearly level to gently sloping soils that are light colored and moderately well drained. They occur on the Wisconsin till plain. The soils have formed in 3 to 5 feet of wind-deposited silt that overlies limy, glacial till of Wisconsin age. The native vegetation was mainly deciduous hardwoods, chiefly hickory and oak.

These soils are in the same catena as the well-drained Manlove and the somewhat poorly drained Reesville soils. They are similar to the Xenia soils but differ in having formed entirely in silt. They belong to the Gray-Brown Podzolic great soil group.

Profile of Birkbeck silt loam, 0 to 2 percent slopes, in a pastured woods (NE¼NW¼ of sec. 6, T. 13 N., R. 14 E., Union County, Ind.):

A_0 ¼ to 0 inch, black (10YR 2/1) to very dark brown (10YR 2/2), partly decomposed leaves and twigs; neutral.

A_{11} 0 to 3 inches, very dark brown (10YR 2/2) silt loam that is brown to pale brown when plowed; weak, granular structure; friable; high content of organic matter; neutral to slightly acid.

A_{12} 3 to 7 inches, dark grayish-brown (10YR 4/2), smooth silt loam; very weak, platy structure; friable; slightly acid.

A_2 7 to 12 inches, yellowish-brown (10YR 5/4) to light yellowish-brown (10YR 6/4), smooth, heavy silt loam; platy to granular structure; friable; some material from the B_1 horizon is mixed with this horizon; slightly acid.

B_1 12 to 15 inches, yellowish-brown (10YR 5/4) silty clay loam; variegated with shades of yellow and brown (10YR 5/6 to 5/3) when crushed; moderate, medium, subangular blocky structure; firm; medium acid to strongly acid.

B_2 15 to 30 inches, yellowish-brown (10YR 5/6) peds of silty clay loam that are coated in lower part; moderate, coarse, angular blocky structure to subangular blocky structure; firm; slightly acid to medium acid.

B_3 30 to 41 inches, yellowish-brown (10YR 5/4), smooth, heavy silt loam mottled with light brownish gray (10YR 6/2) and brownish yellow (10YR 6/6); vesicular; structureless; friable; neutral to slightly acid.

C_1 41 to 45 inches, yellowish-brown (10YR 5/4), gritty silt loam; very friable; neutral to mildly alkaline.

D_1 45 to 55 inches, gray (10YR 6/1) loam till; contains many soft dolomitic fragments; calcareous.

D_2 55 inches +, yellowish-brown (10YR 5/4) to light brownish-gray (10YR 6/2) loam till; contains a few dolomitic pebbles and fragments of igneous rock.

Some of the chief differences among these soils were caused by differences in the thickness of the wind-deposited silt, or loess. Others were the result of erosion, which caused the surface layer to vary in thickness. Differences in the color of the surface layer were caused partly by erosion and partly by plowing, which mixed part of the yellowish-brown subsoil with the surface soil in places. In a few places the B_3 horizon grades to calcareous loess.

Birkbeck silt loam, 0 to 2 percent slopes (BbA).—The profile of this soil is the same as the profile described for the series. The soil occurs in small, level to nearly level areas in Fayette and Union Counties.

This productive soil has no serious limitations. It is cropped intensively. Corn is the principal crop, and yields are moderately high to high. Fertilizer is required, and lime is needed to correct acidity. (Management group 1A.)

Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded (BbB1).—This soil has a profile similar to the one described for the series, but it is more sloping, is slightly eroded, and has better surface drainage. It is on uplands. Some of the areas border streams, and some are on gently undulating knolls and ridges on the divides between the streams.

Generally, water runs off this soil readily. There is a moderate risk of erosion. On the stronger slopes, tillage has exposed the yellowish-brown subsoil in a few small areas.

This soil is productive, but it needs to be protected from erosion if row crops are grown. Otherwise, it can be used and managed about the same as Birkbeck silt loam, 0 to 2 percent slopes. (Management group 1B.)

Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded (BbB2).—This soil has a profile similar to that of Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded, but it has lost part of the original surface soil through erosion. In areas where much of the original surface soil has been lost, the surface layer is yellowish brown, contains more clay than the typical soil, and tends to form hard clods if tilled when wet.

Nearly all of this soil has been used intensively to grow clean-tilled crops, which has accelerated the loss of surface soil through erosion. Consequently, the content of organic matter has been lowered, the supply of plant nutrients depleted, tilth impaired, and the moisture-absorbing capacity reduced.

Erosion has caused yields to become lower on this soil. The yields can be improved by building up the content of organic matter and by applying lime, commercial fertilizer, and manure. In addition, till on the contour, use terraces, and choose a cropping system suited to the soil. Waterways should be grassed to prevent gullying. (Management group 1C.)

Borrow Pits

Borrow pits (Bp).—This mapping unit is made up of areas that have had 3 to 5 feet of the original soil removed. The material that was removed was medium to fine textured. It was taken from a number of soils and was used on the shoulders and slopes of roads or for land fill. This mapping unit has not been placed in a management group.

Brookston Series

The Brookston soils are dark colored and are very poorly drained. They occur in shallow depressions or on extensive flats in areas of glacial drift. The soils have formed from glacial till of Wisconsin age. The till consists of highly calcareous loam, silt loam, or light clay loam. The native vegetation was mainly marsh grasses and maple, elm, ash, gum, and other water-tolerant trees.

These soils have slow to ponded surface runoff and slow internal drainage. Most of the areas in Fayette and Union Counties have been drained, however, and can be used for crops. The soils are in the Russell and Miami catenas. They belong to the Humic Gley great soil group.

Profile of Brookston silty clay loam:

A_{11} 0 to 10 inches, very dark brown (10YR 2/2) silty clay loam; moderate, fine to medium, granular structure; friable; plastic and sticky when wet; neutral.

A_{12} 10 to 14 inches, very dark grayish-brown (10YR 3/2) silty clay loam; strong, medium, angular blocky structure; plastic when wet, and hard when dry; neutral.

A_{13} 14 to 18 inches, very dark grayish-brown (10YR 3/2) silty clay loam; strong, medium to coarse, angular blocky structure; plastic and sticky when wet, and hard when dry; slightly acid to neutral.

B_{21g} 18 to 26 inches, yellowish-brown (10YR 5/4), heavy silty clay loam; many, coarse, distinct mottles of light brownish gray (10YR 6/2) and pale brown (10YR 6/3); massive to coarse, blocky structure; very plastic when wet, and hard when dry; neutral.

B_{22g} 26 to 38 inches, yellowish-brown (10YR 5/4) silty clay loam mottled with very pale brown (10YR 7/4) and gray (10YR 5/1); contains a few pebbles; coarse, blocky structure; plastic when wet, and hard when dry; neutral.

B_{23g} 38 to 53 inches, yellowish-brown (10YR 5/4), brownish-yellow (10YR 6/6), and gray (10YR 5/1), mottled, heavy loam; massive; plastic when wet, and slightly hard when dry; neutral to mildly alkaline.

C_{1g} 53 to 61 inches, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/4) loam; massive; slightly plastic when wet, and slightly hard when dry; slightly calcareous.

C_2 61 inches +, yellowish-brown (10YR 5/4) to pale-brown (10YR 6/3) limy loam till.

The texture of the surface soil ranges from silty clay loam to silt loam. The soils vary in the thickness of horizons and in the depth to calcareous till. The Brookston soils in the Russell catena are slightly more acid and are generally less productive than those in the Miami catena. In some areas, where the Brookston soils occur with soils of the Manlove catena, they have a deeper mantle of silt than the other Brookston soils.

Brookston silty clay loam (By).—The profile of this soil is the same as that described for the series. The soil occurs in shallow depressions throughout most of Fayette and Union Counties.

Most of this soil has been cleared. The areas that have adequate drainage are used for crops. The rest are in permanent bluegrass pasture. Many of the areas occur with Cope silty clay loam or with light-colored soils. In these areas the Brookston soil is generally less extensive than the adjacent soils and is managed the same.

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The cropping system most commonly used is corn, wheat or oats, and a hay crop with an occasional crop of soybeans or some other field crop. Often, corn is grown for 2 or more years in succession, particularly in areas where the Brookston soil is dominant.

If the soil has been drained, it is well suited to row crops, small grains, or meadow. The yields of hay crops are generally high; excellent yields of alfalfa and clover are obtained without applying lime. In some places the yields and quality of fall-seeded grains, particularly of wheat, are lowered by ponded water. (Management group 6A.)

Brookston silt loam (Br).—The profile of this soil is similar to that of Brookston silty clay loam, but the surface layer is more silty and there is somewhat less clay throughout. Tilth is maintained more easily than in Brookston silty clay loam, and less power is required for tillage. Yields are similar. (Management group 6A.)

Celina Series

The soils of the Celina series are moderately well drained. They occur on upland till plains or moraines north of areas of Xenia soils. Slopes of 0 to 8 percent predominate. The native vegetation consisted chiefly of oak, maple, and similar deciduous trees.

These soils are in the same catena as the well-drained Miami soils, the somewhat poorly drained Crosby soils, and the very poorly drained, dark-colored Kokomo soils. They are in the Gray-Brown Podzolic great soil group.

Only one soil type of the Celina series, Celina silt loam, occurs in these counties, and the soils of that type are not mapped separately. They are mapped with Xenia silt loam in three undifferentiated soil groups made up of Xenia and Celina silt loams. The Celina soils have less silt in the surface soil and in the upper part of the subsoil than the Xenia soils. They are also less weathered, and the depth to calcareous till is less.

Profile of Celina silt loam:

A_0 ½ to 1 inch of brown (10YR 5/3), partly decayed forest litter composed of leaves, twigs, and branches from deciduous trees.

A_1 0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; fine, granular structure; friable; organic content is relatively high near the top of layer but decreases gradually with increasing depth; neutral to slightly acid.

A_2 3 to 12 inches, grayish-brown (10YR 5/2) to pale-brown (10YR 6/3) silt loam; medium, granular structure; friable; slightly acid to medium acid.

B_1 12 to 17 inches, pale-brown (10YR 6/3) to pale-yellow (2.5Y 7/4), gritty silty clay loam; contains variable amounts of rock fragments; strong, fine, subangular blocky structure; friable when moist, and slightly hard when dry; medium acid to slightly acid.

B_{21} 17 to 30 inches, mottled yellowish-brown (10YR 5/6), gray (10YR 5/1), and pale-yellow (2.5Y 7/4), gritty silty clay loam to coarse silty clay; strong, medium to coarse, subangular blocky structure; firm when moist, slightly plastic when wet, and hard when dry; contains varying amounts of small, partly weathered glacial stones and some boulders; medium acid.

B_{22} 30 to 33 inches, mottled yellowish-brown (10YR 5/6), gray (10YR 5/1), and pale-yellow (2.5Y 7/4), gritty clay loam; coarse subangular blocky or blocky structure; slightly acid to neutral.

C_1 33 inches +, mottled yellowish-brown (10YR 5/6) and gray (10YR 5/1), highly calcareous fine loam to clay loam glacial till.

In cultivated areas the surface soil is grayish brown to light yellowish brown. The texture of the surface soil ranges from silt loam to loam. In some places the A and B horizons are slightly acid throughout. The depth to mottling ranges from 14 to 30 inches.

Cincinnati Series

The Cincinnati soils are well drained and are gently sloping to very steep. They occur on glacial till plains in the uplands. In these counties the acreage of Cincinnati soils is small and is all in the south-central part of Fayette County. The soils have formed in a layer of loess, 10 to 60 inches thick, that overlies medium-textured, calcareous glacial till of Illinoian age. The native vegetation consisted mainly of hardwood forests of oak, hickory, tulip-poplar, and various other kinds of deciduous trees.

These soils are in the same catena as the Avonburg soils, which are somewhat poorly drained. They are similar to the Russell soils, which have formed from glacial till of Early Wisconsin age. The Cincinnati soils have thicker B horizons, however, are more weathered and more strongly acid than the Russell soils, and are deeper over the calcareous till. They have medium internal drainage and generally have a fragipan. The Cincinnati soils are in the Gray-Brown Podzolic great soil group but intergrade toward Red-Yellow Podzolic soils.

Profile of Cincinnati silt loam, 2 to 6 percent slopes (SE¼NW¼ sec. 28, T. 13 N., R. 12 E., Fayette County, Ind.):

A_p 0 to 6 inches, brown (10YR 5/3), smooth silt loam; weak, fine, granular structure; friable when moist, and slightly hard when dry; medium acid.

A_2 6 to 13 inches, pale-brown (10YR 6/3), smooth silt loam; fine granular to weak, medium platy structure; friable when moist, and slightly hard when dry; medium acid to strongly acid.

B_1 13 to 18 inches, dark yellowish-brown (10YR 4/4), smooth silty clay loam; weak, fine to medium, subangular blocky structure; plastic and sticky when wet, and hard when dry; medium acid to strongly acid.

B_{21} 18 to 24 inches, yellowish-brown (10YR 5/4) silty clay loam; contains some grit; moderate, fine to medium, subangular blocky structure; plastic when wet, and hard when dry; medium acid to strongly acid.

B_{22} 24 to 45 inches, yellowish-brown (10YR 5/4) silty clay loam that contains much grit; a few, medium, distinct mottles of light brownish gray (10YR 6/2) in lower part; moderate, medium, subangular blocky structure; plastic when wet, and hard when dry; strongly acid.

B_{23m} 45 to 78 inches, dark yellowish-brown (10YR 4/4), light silty clay loam; cracks filled and peds coated with light-gray (10YR 7/2) silt; coarse, blocky structure; plastic when wet, and hard when dry; strongly acid.

C_1 78 to 120 inches, yellowish-brown (10YR 5/4) silty clay loam; coarse, blocky structure; plastic when wet, and hard when dry; compact in places; strongly acid in the upper part to neutral in the lower part.

C_2 120 inches +, yellowish-brown (10YR 5/4) loam to coarse clay loam till; somewhat plastic when wet; calcareous.

These soils have slopes that range from 2 to 45 percent. Surface runoff ranges from medium on the milder slopes to very rapid on the steeper slopes. The cover of silt on the steeper and more eroded areas is not so thick as on the normal soil. The depth to the underlying limy material ranges from 10 to 14 feet; the depth to the fragipan ranges from 36 to 50 inches.

Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded (CcB1).—The profile of this soil is similar to the one described for the series, but the surface layer is generally only 8 to 12 inches thick. In some places tillage has exposed the yellowish-brown subsoil. In most places the depth to limy material is 10 feet or more.

Mapped with this soil is a small area of Rossmoyne silt loam, which is not mapped separately in these counties. This included soil has a surface layer of grayish-brown silt loam and a subsoil of brownish-yellow to yellowish-brown silty clay loam. It generally has a fragipan of silt loam to light silty clay loam at depths of 36 to 50 inches. Although the included soil has gentle slopes, the risk of erosion is serious.

Erosion is the major problem in managing Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded. In addition, the soil is strongly acid and is low in plant nutrients. Tilling on the contour, terracing, and growing meadow crops frequently will help to control erosion. Lime and large amounts of fertilizer are needed for crops to grow well and for legumes to make a good stand. Corn and other row crops can be grown on this soil, but, to obtain good yields, these crops should be planted on the contour and fertilized according to the needs indicated by soil tests. (Management group 2A.)

Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded (CcB2).—The profile of this soil is similar to the one described for the series, but the surface layer is less than 8 inches thick and contains less plant nutrients. In some places the yellowish-brown subsoil is exposed. Here, the surface layer is more clayey than that of the typical soil and has a lower content of organic matter and poorer tilth.

Mapped with this soil is a small area of Rossmoyne silt loam, which is not mapped separately in these counties. This included soil is similar to the Rossmoyne soil mapped with Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded, but it has lost more of the surface layer through erosion.

Tilling on the contour and using sodded waterways or a cover crop to protect the soil will aid in controlling erosion on Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded. Clean-tilled crops should be grown less frequently on this soil than on Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded. (Management group 2B.)

Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded (CcC1).—This soil has stronger slopes than Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded. In addition, it generally has a thinner layer of silt and the depth to the underlying limy material is somewhat less. Areas of this soil are scattered throughout the south-central part of Fayette County.

This soil is low in plant nutrients and organic matter and is highly erodible if it is cultivated. It can be managed about the same as Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded, but practices to control erosion should be used more intensively. A suitable cropping system is needed, or the areas should be used to grow hay crops or for permanent pasture. (Management group 2C.)

Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded (CcC2).—The profile of this soil is similar to that described for the series, but it has lost more of its surface soil through erosion. In places only 3 to 8 inches of the original surface soil remains. In some places the light-colored subsoil is exposed.

The risk of erosion is serious on this soil. It should be cropped less intensively and requires more careful use of practices to control erosion than suggested for Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded. If row crops are grown, contour tillage and terracing are necessary. For most areas, a permanent hay crop or pasture is suggested for this soil. Break the sod only when it becomes necessary to renew the stand of legumes. (Management group 2D.)

Cincinnati soils, 6 to 12 percent slopes, severely eroded (CnC3).—These soils have 4 inches or less of the original surface layer left, but otherwise they have a profile similar to that described for the series. In many places the subsoil has been exposed by tillage. In areas where the subsoil has been exposed, the color of the present surface soil is grayish brown to yellowish brown and the texture ranges from silt loam to silty clay loam. In the more severely eroded areas, there are many gullies; some areas are completely dissected by gullies.

Erosion is the major problem in managing these soils. In addition, the soils are strongly acid, are low in organic matter and plant nutrients, and have poor tilth. Corn, wheat or rye, and mixed hay crops are generally grown, but yields are low. Many of the areas that have been cleared are left idle. These are covered with broomsedge or are reverting to timber. If cropped, the soils require special care to control erosion and to increase the supply of plant nutrients. They are best kept in pasture or timber. If the soils are reseeded to grass or legumes, lime and fertilize them according to the needs indicated by soil tests. (Management group 2E.)

Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded (CcD1).—The profile of this soil is similar to that described for the series, but part of the original surface layer has been lost through erosion.

Mapped with this soil is a small area of Parke silt loam, which is not mapped separately in these counties. This included soil has a surface layer of brown silt loam and a subsoil of reddish-yellow to brown silty clay loam. The substratum, at depths between 24 and 40 inches, is reddish-brown sandy clay loam that becomes more sandy with increasing depth. This included soil is moderately permeable to water, air, and roots.

Most of Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded, is still under forest and is but little eroded. The risk of erosion would be serious if the soil were cleared. Therefore, it is best to use the soil for permanent pasture or timber. (Management group 2F.)

Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded (CcD2).—The profile of this soil is similar to that described for the series, but the soil is more eroded. The surface layer is 3 to 8 inches thick. In many places part of the lighter colored subsoil has been mixed with the darker colored surface soil. In the more severely eroded areas, the yellowish-brown subsoil is exposed.

This soil is difficult to till, and the risk of erosion is serious. Therefore, it is best used for permanent pasture or timber. Adding lime and fertilizer and planting suitable legumes will improve yields on the pastures. Apply lime and fertilizer according to the needs indicated by soil tests. (Management group 2F.)

Cincinnati soils, 12 to 18 percent slopes, severely eroded (CnD3).—These soils have lost much of the original surface layer through erosion, but their profile is otherwise similar to that described for the series. In most places the present surface layer consists of yellowish-brown silty clay loam from the subsoil that has been mixed with the surface soil by tillage.

These soils are best kept in permanent pasture or should be replanted to trees because of the serious risk of erosion. Applying lime and fertilizer according to the needs indicated by soil tests will help to obtain satisfactory yields of pasture. (Management group 2F.)

Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded (CcE1).—The profile of this soil is similar to that described for the series, but it has been slightly eroded. Included with this soil in mapping is a small area of Parke silt loam, which is not mapped separately in these counties. The included soil has a surface layer of brown silt loam and a substratum of reddish sandy loam to sandy clay loam.

Most of Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded, is in timber, which has controlled erosion. Areas not in timber should be used for pasture. (Management group 2G.)

Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded (CcE2).—From 1/4 to 3/4 of the original surface layer of this soil has been lost through erosion, and there are gullies in a few places. The present surface layer consists of grayish-brown silt loam, 3 to 8 inches thick. In places the yellowish-brown clay in the subsoil is exposed or is mixed, in varying amounts, with the surface soil.

Mapped with this soil in Fayette County are a few small areas of a Parke soil that is also moderately eroded. The Parke soils are not mapped separately in these counties.

In the past, Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded, was cropped or left without a protective cover of pasture or timber. Now, it is best used for pasture if it can be used in a livestock program of farming. Otherwise, it should be replanted to trees. (Management group 2G.)

Cincinnati soils, 18 to 25 percent slopes, severely eroded (CnE3).—These soils have lost three-fourths or more of their original surface layer and some of the subsoil through erosion. There has been severe gullying in much of the acreage; some gullies are 3 to 5 feet deep or more.

Most areas of these soils have been left without a protective cover of plants. As a result, erosion has exposed the silty clay loam in the subsoil. The present surface layer has poor tilth and is low in organic matter and plant nutrients. These soils provide a poor seedbed for hardwood trees. They are probably best suited to conifers and, where cleared, to renovate for permanent pasture. (Management group 2G.)

Cincinnati silt loam, 25 to 45 percent slopes, eroded (CcF2).—Although most of this soil is moderately eroded, erosion ranges from none to severe.

This soil is probably better suited to trees than to other uses. If it can be used in a livestock program of farming, however, the areas that have been cleared can be renovated for pasture. (Management group 2H.)

Cope Series

The Cope soils are moderately dark colored and are poorly drained to very poorly drained. They occur in depressions, on flats that were formerly under water, or at the heads of drainageways. They have formed on highly calcareous glacial till of Wisconsin age. The native vegetation was swamp grasses under a swamp forest made up of deciduous trees, mainly soft maples and elms. Most of the areas have been drained to make them suitable for crops.

These soils are in the same catena as the well drained Russell soils, the moderately well drained Xenia soils, the somewhat poorly drained Fincastle soils, the poorly drained Delmar soils, and the very poorly drained Brookston and Kokomo soils. The Cope and Brookston soils occur in similar positions, but the areas of the Cope soils are not so long, nor are they so wide and deep as those occupied by the Brookston soils. The Cope soils are lighter colored and contain less organic matter than the Brookston. This is partly because less organic matter has accumulated in them and partly because organic matter has been lost when the soils were cultivated.

The soils of the Cope series are in the Humic Gley great soil group but intergrade toward the Low-Humic Gley soils. They occur near soils of the Gray-Brown Podzolic great soil group.

Profile of Cope silty clay loam in a wooded area:

A_{11} 0 to 6 inches, very dark grayish-brown (10YR 3/2) to dark-gray (10YR 4/1) silty clay loam; moderate, medium, granular structure; contains black (10YR 2/1) to very dark gray (10YR 3/1) iron-manganese concretions that are very dark grayish brown (10YR 3/2) when crushed; slightly sticky and plastic when wet; neutral.

A_{12} 6 to 13 inches, dark-gray (10YR 4/1) to grayish-brown (10YR 5/2) silty clay loam; moderate, medium, subangular blocky structure; moderately plastic and slightly sticky when wet; firm to friable when moist; neutral.

B_{21g} 13 to 23 inches, grayish-brown (10YR 5/2), heavy silty clay loam; thin coats mottled with dark yellowish brown (10YR 4/4) on faces of peds; peds are gray (10YR 5/1) to yellowish brown (10YR 5/6) when crushed; strong, fine to medium, subangular blocky structure; plastic and sticky when wet; neutral.

B_{22g} 23 to 29 inches, light olive-brown (2.5Y 5/4) clay loam to heavy silty clay loam; common, medium, distinct mottles of grayish brown (2.5Y 5/2) and dark yellowish-brown (10YR 4/4); strong, coarse, subangular blocky structure; neutral to mildly alkaline.

B_{3g} 29 to 47 inches, light olive-brown (2.5Y 5/4), heavy silt loam with common, medium, distinct mottles of dark brown (7.5YR 4/4) and gray (2.5Y 5/1); grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) when crushed; massive structure; friable when moist, slightly plastic and sticky when wet; contains some grit and fragments of shale; neutral to mildly alkaline.

B_{32g} 47 to 53 inches, light olive-brown (2.5Y 5/4) loam to heavy loam with common, medium, distinct mottles of dark brown (7.5YR 4/4) and gray (2.5Y 5/1); grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) when crushed; massive structure; slightly plastic and sticky when wet; mildly alkaline.

C_1 53 to 59 inches, light olive-brown (2.5Y 5/4) loam till but grayish brown (2.5Y 5/2) to light olive brown (2.5Y 5/4) when crushed; mildly calcareous.

C_2 59 inches +, yellowish-brown (10YR 5/6) loam till; some yellowish-brown (10YR 5/4), fine concretions; calcareous.

The surface layer ranges in texture from silty clay loam to heavy silt loam. It ranges in thickness from 8 to 13 inches and, in reaction, from slightly acid to neutral. The depth to calcareous till ranges from 48 to 72 inches.

Mapped with the Cope soils are some areas of Ragsdale soils that were too small to map separately in these counties. These included soils have formed in 3 to 5 feet of loess that overlies loamy glacial till.

Cope silty clay loam (Cp).—The profile of this soil is the same as the profile described for the series.

Poor drainage is a limiting factor in the use of this soil, but most of the areas have been drained enough for crops to grow. The soil is sticky and plastic when wet, because of the clayey texture and poor drainage. When it dries, wide, deep cracks develop. If the soil is tilled when wet, it becomes cloddy. The clods are difficult to break.

About 95 percent of this soil is cultivated and is used in a corn-hog system of farming. Beef cattle are next to hogs in importance, and some sheep are raised. Because pastures are needed for the livestock and because the soil is intricately mixed with the light-colored Fincastle soils, many farmers use a 3-year cropping system of corn, wheat or oats, and meadow, or they grow soybeans before the small grain. Some farmers use a 4-year cropping system in which the soil is used for mixed grasses and legumes for 2 years, instead of for meadow. In some places this soil occurs in areas where Brookston, Kokomo, or other dark-colored soils predominate. Here, corn is generally grown for 2 or more years in succession.

This soil is well suited to soybeans, which are grown about as extensively as wheat. Alfalfa and clover are grown without applying lime. Good stands are obtained, but these crops are sometimes winterkilled. Alfalfa can be grown as part of a meadow mixture. It is seeded alone only if the soil is drained adequately and if the stand is to remain for 2 or more years. (Management group 6A.)

Cope silt loam (Co).—This soil has a surface layer that contains less clay than that in the profile described for the series; otherwise, the two profiles are similar. This soil occurs in shallow depressions on the upland divides.

Normally, this soil is in the Russell catena, but in some areas, where it has formed largely in silt, it is in the Manlove catena. The deposits of silt are 3 to 5 feet deep and overlie loamy, calcareous glacial till in some places. In other places the silt is limy to depths of 3 feet or more.

In a few places the surface layer contains enough sand to make the texture loamy. Here, tillage is easier than in the typical soil. In a few places the soil is on the side slopes of depressions and has slopes ranging from 2 to 4 percent. In some of these places, the drainageways should be seeded to grass, because they are shallow and tend to erode.

This soil can be used and managed the same as Cope silty clay loam. Yields of crops are about the same. (Management group 6A.)

Crosby Series

The Crosby soils are light colored. They are somewhat poorly drained, but most of the areas have been drained artificially to make them suitable for crops, usually by draining the associated Brookston soils. The soils are nearly level to gently undulating. They have formed from highly calcareous glacial till of Wisconsin age. The texture of the till is loam or coarse clay loam. The native vegetation was predominantly beech and sugar maple but included elm, ash, and white and black oaks.

These soils are in the same catena as the well drained Miami soils, the moderately well drained Celina soils, and the very poorly drained Brookston and Kokomo soils. Unlike the Crosby soils, the Brookston soils are dark colored, and the Kokomo are very dark colored. In drainage the Crosby soils are similar to the Fincastle soils, but the Fincastle soils have formed in loess that overlies highly calcareous glacial till of early Wisconsin age. The Crosby soils contain more gritty material than the Fincastle soils. They are also less acid in the surface layer and in the upper part of the subsoil, and the depth to calcareous material is less. The Crosby soils generally lie north of the Fincastle soils. The soils of the Crosby series belong to the Gray-Brown Podzolic great soil group.

Profile of Crosby silt loam in a wooded area (NE¼NE¼ sec. 15, T. 15 N., R. 11 E., Fayette County, Ind.):

A_0 ¼ to 0 inch, dark yellowish-brown (10YR 4/4), well-decomposed organic matter, mostly decaying twigs and leaves; slightly acid to neutral.

A_1 0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine, granular structure; friable when moist, slightly hard when dry, and slightly plastic when wet; moderately high content of organic matter; slightly acid.

A_2 7 to 10 inches, light brownish-gray (10YR 6/2) silt loam; a few, fine, distinct mottles of yellowish brown (10YR 5/6); medium, granular structure; slightly acid to medium acid.

B_1 10 to 13 inches, very pale brown (10YR 7/3) silt loam to heavy silt loam; many, medium, prominent mottles of yellowish brown (10YR 5/4); weak, medium, subangular blocky structure; low content of organic matter; medium acid.

B_2 13 to 22 inches, light yellowish-brown (10YR 6/4), gritty silty clay loam mottled with grayish brown (10YR 5/2); peds are coated with very dark grayish-brown (10YR 3/2) clay in lower part; strong, medium to coarse, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid, but becomes slightly acid in lower part.

C_1 22 inches+, light yellowish-brown (10YR 6/4) loam till; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, blocky structure; calcareous.

The depth to calcareous till ranges from 12 to 42 inches in these soils. In Fayette County the depth to till is normally less than 20 inches, but in Union County it is about 30 inches. In places Crosby silt loam grades to Brookston silty clay loam. Here, the surface layer is generally somewhat darker in color and is slightly heavier in texture than in the profile described. In other places, where Crosby soil grades to Celina silt loam, the color of the surface soil is more nearly grayish brown than that of the typical profile and the drainage is somewhat better than normal. In a few places the soil is slightly acid.

Crosby silt loam, 0 to 2 percent slopes (CrA).—The profile of this soil is similar to the profile described for the series. This soil occurs in an intricate pattern with the Brookston soils in the northwestern part of Fayette County. It also occupies small areas adjacent to the Miami and Brookston soils and is generally farmed about the same as those soils. Most of this soil is cultivated, although a small part of it is in pasture or timber.

The cropping system commonly used consists of corn, wheat or oats, and a hay or pasture crop grown for 1 or 2 years. Some farmers grow soybeans before the small grain is seeded. If more corn is needed than can be obtained by using this cropping system, corn can be grown oftener in the cropping system, particularly in places where a large proportion of Brookston soil is mixed with this soil.

This soil must be drained adequately if wheat and alfalfa are grown, because these crops are damaged readily by excess surface water. Adequate lime and commercial fertilizer, particularly nitrogen and potash, are also required to maintain good yields. Bluegrass pasture can be maintained and improved by applying adequate lime and a commercial fertilizer, particularly phosphate. (Management group 5A.)

Crosby silt loam, 2 to 6 percent slopes, slightly eroded (CrB1).—This soil is similar to Crosby silt loam, 0 to 2 percent slopes, but it has stronger relief and more rapid runoff. Some of the surface layer has been removed by erosion.

The present surface layer ranges from 8 to 12 inches in thickness. In places small spots of the mottled, heavy-textured subsoil are exposed. Internal drainage is slow. In some areas crops will benefit by artificial drainage.

Although practices are needed to improve drainage and to control erosion, drainage and erosion are not serious problems in managing this soil. The soil can be used and managed about the same as Crosby silt loam, 0 to 2 percent slopes. (Management group 5B.)

Crosby silt loam, 2 to 6 percent slopes, moderately eroded (CrB2).—The profile of this soil is similar to the one described for the series. The surface layer is generally 3 to 8 inches thick. In some places much of the original surface layer has been removed through erosion. In eroded areas the lighter colored, more clayey subsoil has been mixed with the darker colored surface soil by plowing.

Although the slow internal drainage makes management of this soil difficult, erosion is the principal problem. In areas where the subsoil is exposed, more power is needed for tillage than in less eroded areas. In addition, the supply of plant nutrients is lower than in less eroded areas. The soil tends to be clayey and makes a poor seedbed.

Where feasible, this soil should be tilled on the contour. It needs organic matter to improve tilth, and this can be supplied by adding manure. A cover of plants will protect the soil from erosion. Legumes grown for hay should be included in the cropping system. Grow the legumes for a long enough period so that they will help build up the supply of plant nutrients. In the areas where legumes are to be grown, apply lime according to the needs indicated by soil tests. (Management group 5B.)

Delmar Series

The Delmar soils are poorly drained and are nearly level. They occur on glacial till plains. The soils have formed in a layer of silt, 18 to 36 inches thick, that overlies glacial till of loam to clay loam texture. The till is calcareous at depths between 36 and about 70 inches. The native vegetation was mainly sugar maple, beech, elm, ash, and white and black oaks.

These soils belong to the same catena as the well drained Russell soils, the moderately well drained Xenia soils, the somewhat poorly drained Fincastle soils, the poorly drained Cope soils, and the very poorly drained Brookston and Kokomo soils. Unlike the Delmar soils, the Cope, Brookston, and Kokomo soils are dark colored. The Delmar soils are Planosols. Only one soil of this series, Delmar silt loam, occurs in Fayette and Union Counties.

Profile of Delmar silt loam, in a cultivated field:

A_p 0 to 7 inches, light-gray (10YR 7/1) to gray (10YR 6/1) smooth silt loam; low content of organic matter; has a few small, hard, rounded, black iron-manganese concretions on the surface and throughout the soil; friable; medium acid to strongly acid.

A_2 7 to 12 inches, light-gray (10YR 7/1) to gray (10YR 6/1), smooth silt loam with a few pale-yellow blotches and many iron-manganese concretions; weak, platy structure or coarse, granular structure; friable; medium acid to strongly acid.

B_1 12 to 17 inches, light-gray (10YR 7/1), smooth, light silty clay loam mottled with pale yellow (2.5Y 8/4) and light olive brown (2.5Y 5/6); fine, subangular blocky structure, but peds are crushed easily when moist; firm; medium acid to strongly acid.

B_{21} 17 to 36 inches, light-gray (10YR 7/1) silty clay loam mottled with light olive brown (2.5Y 5/6); coarse to very coarse, subangular blocky structure; firm when moist, and hard when dry; generally smooth in the upper part of layer, but the amount of grit and the number of partly weathered fragments of rock increase with increasing depth; strongly acid to medium acid.

B_{22} 36 to 48 inches, mottled gray (2.5Y 5/0), yellow (2.5Y 7/6), and light olive-brown (2.5Y 5/4) silty clay loam that is somewhat more friable than material in horizon immediately above; contains variable amounts of pebbles and fragments of rock; coarse to very coarse, subangular blocky structure; firm when moist, and hard when dry; strongly acid in the upper part but grades to slightly acid material in the lower 4 to 6 inches.

C_1 48 inches+, gray (2.5Y 6/0) to pale-yellow (2.5Y 7/4), highly calcareous glacial till consisting of loam to coarse clay loam.

In some places the Delmar soils grade to Brookston soils. Here, the surface layer is darker and has a higher content of organic matter than the normal soil. In other places, where the Delmar soils grade to Fincastle soils, the surface layer is light brownish gray and the soil is somewhat better drained than normal. In several places, where the Delmar soils grade to Reesville soils, the silt is 50 to 60 inches deep. In some places the depth to calcareous material is only about 36 inches.

Delmar silt loam (De).—The profile of this soil is the same as the profile described for the series. The soil occurs in small areas throughout Fayette and Union Counties.

Poor drainage limits the use of this soil. Before crops can be grown successfully, the drainage must be improved. The supply of plant nutrients is fairly low.

It can be increased by adding large amounts of fertilizer and adequate lime. The soil needs organic matter. This can be supplied by adding all of the barnyard manure available and by turning crops under as green manure.

The cropping system generally used consists of corn, wheat, soybeans, and hay crops. The soil is not suited to oats; the planting of the oats crop is often delayed in spring, and the crop is damaged by lack of moisture during the summer. Clover and alfalfa need lime to make good stands. At times they are damaged by excessive moisture or by frost heaving. (Management group 5A.)

Eel Series

The Eel soils are moderately well drained and are nearly level. They occur in drainageways and on the flood plains of streams where they are subject to intermittent flooding. These soils have formed in neutral to mildly calcareous alluvium. The alluvium was washed from upland and terrace areas of glacial drift of Wisconsin age. The native vegetation was a deciduous forest made up of water-tolerant oaks, elms, hackberries, and soft maples.

These soils are in the same catena as the moderately well drained Genesee soils, the somewhat poorly drained Shoals soils, and the very poorly drained Sloan soils. They have medium internal drainage in the upper part of the profile, but, because of a high water table, internal drainage is medium to slow in the lower part. The Eel soils belong to the Alluvial great soil group.

Profile of Eel silt loam (NE¼NE¼ sec. 18, T. 14 N., R. 13 E., Fayette County, Ind.):

A_{1p} 0 to 8 inches, brown (10YR 5/3) to dark grayish-brown (10YR 4/2) silt loam; fine, granular structure; somewhat plastic when wet; moderate content of organic matter; neutral to calcareous.

A_{12} 8 to 16 inches, brown (10YR 5/3) silt loam; medium, subangular blocky structure; friable when moist, and somewhat plastic when wet; calcareous.

C_1 16 to 26 inches, dark grayish-brown (10YR 4/2) silt loam mottled with brown (10YR 5/3); fine, granular structure to medium, subangular blocky structure; friable when moist, and slightly plastic when wet; calcareous.

C_2 26 to 32 inches, dark grayish-brown (10YR 4/2) silt loam; medium, granular structure to medium, subangular blocky structure; friable when moist, and slightly plastic when wet; calcareous.

The texture of the Eel soils varies somewhat in places, depending on the degree of overflow. In the valley of the Whitewater River and in some other valleys where the soil occurs around washouts, the texture of the substratum ranges from gravelly loam to silty clay loam within short distances. In these places the color and the thickness of the horizons also vary.

Eel silt loam (Es).—The profile of this soil is the same as the profile described for the series.

Mapped with this soil are a few small areas of Eel silty clay loam, which is not mapped separately in these counties. This included soil is mainly in swales and in old stream channels, and the areas are flooded frequently. The included soil is similar to Eel silt loam, but it consists of grayish-brown, friable silty clay loam to a depth of 8 inches; the underlying soil is similar to the surface soil but is slightly more compact. In places thin lenses of silt or sand occur throughout the profile.

Also mapped with this soil are some areas of Eel silt loam that occur at a slightly higher elevation than the typical soil. These areas were too small to map separately. This included soil is similar to the typical Eel silt loam. The upper part of the subsoil is slightly heavier textured than that of the typical soil, however, and has a moderate, subangular blocky structure.

Periodic overflows limit the use of Eel silt loam for crops. The floods generally occur in winter, but sometimes they occur in spring, early in summer, or late in fall, as the result of rains. The soil is well suited to corn and soybeans, but these crops may be lost because of flooding. In some years it is necessary to replant late in spring. Generally, the best crops to use are ones that can be planted and harvested during the comparatively short growing season.

Corn is the main crop grown. The soil has a good supply of plant nutrients, but nitrogen is needed for high yields of corn. In some places potash is needed. Apply fertilizer in amounts determined by soil tests. (Management group 7B.)

Eel loam (Ee).—This soil is somewhat lighter textured than Eel silt loam, but it is otherwise similar. The surface layer is grayish brown and contains a moderate amount of organic matter. Sand occurs in varying amounts at depths below 15 to 30 inches, and in some places there is fine gravel.

Mapped with this soil are some small areas of Eel fine sandy loam, which is not mapped separately in these counties. This included soil is similar to Eel loam. The texture of the surface layer is fine sandy loam, however, and the texture in the upper part of the subsoil is somewhat lighter and sandier. The included soil generally occurs in long, narrow areas along streams and on the adjoining fairly steep slopes of uplands or terraces.

Overflow is the main problem in managing Eel loam. The soil is used and managed the same as Eel silt loam, and yields are similar. Nevertheless, more of this soil is in pasture or forest. The quality of the pastures is good to excellent, but pastures could be improved in many areas by controlling the weeds. (Management group 7B.)

Fairmount Series

The Fairmount soils are well drained to excessively drained. The areas are adjacent to the valleys of streams and drainageways. The soils have formed from weathered products of limestone and shale of the Ordovician and Silurian periods. They occur in areas where geological erosion is active. As a result, only a thin mantle of soil material has accumulated over the parent rock. The native vegetation consisted of red and black oaks, hickory, elm, and some cedar trees.

The profiles of these soils are weakly developed and lack of a definite B horizon. Depth to bedrock is generally less than 36 inches. Flat slabs of limestone and varying amounts of fragments of limestone are on the surface and throughout the profile. The soils are in the Rendzina great soil group.

Profile of Fairmount silty clay loam, 12 to 18 percent slopes:

A_{11} 0 to 3 inches, very dark grayish-brown (10YR 3/2) silty clay loam; fine to medium, granular structure; friable when moist, but sticky when wet; has a high content of organic matter; contains many feeder roots; neutral.

A_{12} 3 to 7 inches, dark yellowish-brown (10YR 4/4) fine silty clay loam; medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; neutral.

C_1 7 to 12 inches, pale-olive (5Y 6/3) to light yellowish-brown (2.5Y 6/4) clay; angular blocky structure; very plastic when wet, and hard when dry; neutral to calcareous clay shale.

C_2 12 inches +, interbedded calcareous clay and limestone.

Slopes range from 2 to 50 percent in these soils. The solum ranges from only a few inches to 36 inches in thickness. The color of the surface soil and subsoil varies. In areas where the soil material is thicker, the subsoil is olive yellow; in these areas the soil has a lower content of organic matter than normal and an angular blocky structure. In many places the profile has a weakly developed B horizon. An area of Fairmount silty clay loam having steep slopes is shown in figure 4.

Fairmount silty clay loam, 2 to 6 percent slopes (FaB).—The profile of this soil is similar to the profile described for the series. The surface layer is darker and thicker, however, and the subsoil is yellower and thicker. In addition, depth to calcareous clay and rock is greater.

Alfalfa, tobacco, clover, and small grains are the principal crops. In some places a small grain is planted as a nurse crop when meadows are seeded. The risk of erosion is serious. The soil is neutral in reaction, and its supply of plant nutrients is high. It is probably best suited to alfalfa meadow or to permanent bluegrass pasture. If well managed, it can be used for tobacco. Bluegrass pastures produce high yields of forage. (Management group 3A.)

Fairmount silty clay loam, 6 to 12 percent slopes (FaC).—The profile of this soil differs from the one described for the series in thickness of layers and in depth to bedrock. Areas that have been cropped or grazed intensively are slightly to severely eroded. As a result, the surface layer varies in color and in thickness. In some places the olive-yellow subsoil is exposed. In the more severely eroded areas, there are many slabs of rock on the surface and throughout the profile.

Figure 4.—**Fairmount silty clay loam on steep slopes.**

Generally, the less sloping areas of this soil are used to grow tobacco, small grains, and alfalfa. When yields decline because of erosion, the soil is placed in long-term meadow or permanent pasture until it is built up enough to be used for crops again. In soils used for corn and tobacco, yields are fair to good for a few years. They soon decline, however, unless a suitable cropping system is used and other good management is practiced.

This soil is well suited to alfalfa. Good stands can be secured without adding lime. The soil is also well suited to bluegrass pasture. (Management group 3A.)

Fairmount silty clay loam, 12 to 18 percent slopes (FaD).—The profile of this soil is similar to the profile described for the series. The depth to limestone is generally about 12 inches. Surface runoff is very rapid, and internal drainage is medium to slow.

This soil is mainly in permanent pasture or timber. It is well suited to alfalfa, but seeding and harvesting of the alfalfa are difficult because of the steep slopes. In addition, this crop is likely to be damaged by frost heaving and winterkilling. This soil requires careful management. (Management group 3B.)

Fairmount silty clay loam, 18 to 25 percent slopes (FaE).—This soil is similar to Fairmount silty clay loam, 12 to 18 percent slopes. It differs in slope, in the thickness of the soil layers, and in the amount of rock fragments that occur throughout the profile. The use and management are about the same. (Management group 3C.)

Fairmount silty clay loam, 25 to 35 percent slopes (FaF).—This soil differs from Fairmount silty clay loam, 12 to 18 percent slopes, in slope, in thickness of the soil layers, and in the amount of rock fragments throughout the profile. The two soils are otherwise similar and can be used and managed in about the same way. (Management group 3C.)

Fairmount silty clay loam, 35 to 50 percent slopes (FaG).—The profile of this soil is similar to Fairmount silty clay loam, 12 to 18 percent slopes, but this soil has steeper slopes. It also differs in the thickness of the soil layers and in the number of rock fragments throughout the profile. The two soils can be used and managed in about the same way. (Management group 3D.)

Fincastle Series

The Fincastle soils are light colored and are nearly level to gently sloping. They are somewhat poorly drained; surface runoff and internal drainage are slow, but the soils are suitable for tile drainage. The soils occur on glacial till plains. They have formed in a layer of loess, 18 to 36 inches thick, that overlies glacial till of loam to coarse clay loam. These soils are widely distributed throughout Fayette and Union Counties. The native vegetation was beech, elm, sugar maple, and white, black, and pin oaks.

These soils are in the same catena as the well drained Russell soils, the moderately well drained Xenia soils, the poorly drained Delmar soils, and the very poorly drained Brookston and Kokomo soils. In contrast to the Fincastle soils, the Kokomo soils are very dark colored. The Fincastle soils are similar to the Crosby but have a less gritty and more acid surface layer and are less gritty and more acid in the upper part of the subsoil. They are also deeper over calcareous till. In some areas the Fincastle soils are shallow, and these areas are mapped with the Crosby soils as an undifferentiated soil group. The Fincastle soils are in the Gray-Brown Podzolic great soil group.

Fincastle silt loam, 0 to 2 percent slopes:

A_p 0 to 7 inches, pale-brown (10YR 6/3) silt loam; moderate, fine, granular structure; friable when moist, and slightly plastic when wet; slightly acid.

A_2 7 to 11 inches, grayish-brown (10YR 5/2) silt loam with a few mottles of yellowish brown (10YR 5/6); weak, fine, granular structure to weak, thin, platy structure; friable when moist, and slightly plastic when wet; medium acid.

B_1 11 to 14 inches, pale-brown (10YR 6/3), heavy silt loam with a few, fine, distinct mottles of yellowish brown (10YR 5/8); somewhat firm when moist, and slightly plastic when wet; strongly acid.

B_2 14 to 33 inches, yellowish-brown (10YR 5/4) silty clay loam with many, medium, distinct mottles of brownish yellow (10YR 6/6); firm when moist, plastic when wet, and hard when dry; medium acid.

B_3 33 to 48 inches, yellowish-brown (10YR 5/6) clay loam in upper part of horizon; dark yellowish brown (10YR 4/4) in lower part; contains some grit; moderate, medium, subangular blocky structure; firm when moist, and plastic when wet; medium acid.

C_1 48 inches +, light yellowish-brown (10YR 6/4) loam; weak, coarse, blocky structure; calcareous.

The Fincastle soils vary in color, in texture, and in the thickness of horizons. The depth to calcareous till ranges from 42 to 70 inches. In the B_2 horizon the pH ranges from 4.6 to 5.8.

Fincastle silt loam, 0 to 2 percent slopes (FcA).—The profile of this soil is similar to the profile described for the series. Normally, this soil is strongly acid, however, and is low in organic matter and nitrogen. It occurs with Brookston, Cope, Russell, and Xenia soils. In areas where the soil grades to Brookston silty clay loam, the surface layer has a somewhat darker color and a slightly heavier texture than that of the typical soil. In many small areas the soil is shallower than the typical soil.

This soil is limited mainly by wetness, but its use and management are determined largely by the soil that predominates in a particular field. In areas where the soil occurs with the Brookston and Cope silty clay loams, drainage is often improved by tile draining the adjoining soils.

A grain-livestock type of farming is best suited to this soil. Generally, the cropping system consists of corn, wheat or oats, soybeans, and a hay crop, with corn following the hay crop. In places corn follows other crops in the rotation, especially when fall-sown small grains have been winterkilled. In areas where the dark-colored Cope and Brookston soils predominate, corn is often grown for 2 years in succession. To obtain good yields of corn and to improve tilth, include a legume in the cropping system, apply large amounts of fertilizer, and turn under manure and all the crop residues available.

Wheat generally follows corn in the cropping system. On most farms it is fertilized liberally with a commercial fertilizer and is topdressed with manure if manure is available. This soil is not so well suited to wheat and other small grains as the Russell silt loams. Small grains are sometimes damaged by frost heaving.

The hay crops grown are a mixture of red and ladino clovers, timothy, and alsike, or alfalfa grown alone. Before good stands of clover or alfalfa can be obtained, enough lime must be added to correct the soil acidity. Like the small grains, alfalfa and clover are sometimes damaged severely by frost heaving. (Management group 5A.)

Fincastle silt loam, 2 to 6 percent slopes, slightly eroded (FcB1).—In some places the surface layer of this soil is thinner than that in the profile described for the series. The two soils are otherwise similar.

Except on some flat areas, surface runoff is generally adequate to remove much of the excess surface water. If the soil is used for clean-tilled crops, it is likely to erode. Consequently, more care should be used in choosing the crops to be grown than is necessary on the typical soil. Erosion can be controlled by using contour tillage, where feasible, grassing waterways, and using a cropping system in which meadow crops are grown more of the time than tilled crops. This soil is generally used the same as Fincastle silt loam, 0 to 2 percent slopes, and yields are about the same. (Management group 5B.)

Fincastle silt loam, 2 to 6 percent slopes, moderately eroded (FcB2).—The profile of this soil is similar to that of Fincastle silt loam, 0 to 2 percent slopes, but the surface layer is only 3 to 8 inches thick. In the more severely eroded areas, plowing has mixed part of the yellowish-brown silty clay loam of the subsoil with the grayish-brown surface soil. In some small areas the subsoil is exposed. Here, the soil is less permeable and more erodible than the normal soil and tends to be cloddy. Such severely eroded areas make poor seedbeds.

The management practices required for this soil are similar to those needed for Fincastle silt loam, 2 to 6 percent slopes, slightly eroded, but they must be applied more intensively. The soil needs enough lime to correct the acidity. Permeability and tilth can be improved by increasing the content of organic matter. Manure and crop residues turned under and crops grown as green manure will help to increase the organic matter in the soil. The organic matter can also be increased by applying commercial fertilizer and thus increasing the amount of crop residues available for return to the soil. (Management group 5B.)

Fincastle and Crosby silt loams, 0 to 2 percent slopes (FeA).—The soils in this undifferentiated soil group have profiles similar to those described for the two series. The thickness of the mantle of loess and the depth to calcareous material vary. The silt is generally about 24 inches thick, but it ranges from 15 to 30 inches in thickness. The depth to calcareous till ranges from 24 to 42 inches but is generally about 36 inches.

Mapped with these soils are small areas of Delmar silt loam that is shallower than the typical Delmar soil. This included Delmar soil is more poorly drained than the surrounding Fincastle and Crosby soils.

The use of these soils is limited mainly by wetness, but the soils are also fairly low in organic matter. The soils are used and managed about the same as Fincastle silt loam, 0 to 2 percent slopes. They are less acid than that soil, however, so they are better suited to red clover. (Management group 5A.)

Fincastle and Crosby silt loams, 2 to 6 percent slopes (FeB).—The soils in this undifferentiated soil group have profiles similar to those described for the two series.

Surface runoff is rapid enough to provide adequate drainage, but internal drainage is slow. In many places

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the surface layer is shallower than that of the normal soil, and in some places the subsoil is exposed.

Crops to be grown on these soils must be chosen carefully. Lime and fertilizer are needed. Where feasible, use contour tillage and grass the waterways. (Management group 5B.)

Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded (FeB2).—The soils in this undifferentiated soil group have profiles similar to those described for the two series. They generally have slightly thinner layers, however, and are slightly shallower over calcareous materials. The surface layer ranges from 3 to 8 inches in thickness. In some small areas plowing has mixed part of the subsoil with the surface soil, and in others the subsoil is exposed. In these areas the surface layer is yellowish brown. It is more clayey than normal and is somewhat cloddy if used as a seedbed.

Surface runoff is rapid enough to provide adequate drainage, but internal drainage is slow. There is a moderate risk of erosion. The soils can be used for the same kinds of crops as are grown on Fincastle silt loam, 0 to 2 percent slopes, and yields are about the same. More careful management is needed, however, because large amounts of soil will be lost if clean-tilled crops are grown. (Management group 5B.)

Fox Series

The Fox soils are well drained to somewhat excessively drained. They occur mostly on the terraces of the larger streams at elevations of 5 to 10 feet or more above the bottom lands. The soils have formed in thin deposits of loamy materials that overlie highly calcareous, stratified gravel and sand. Locally, they are called gravelly benchland. The soils are porous. The steeper ones erode readily. The native vegetation was a mixed hardwood forest in which maples and oaks predominated.

In some areas the soils have formed in calcareous gravel and sand that was deposited on the slopes of knolls and winding ridges on the till plain. In these areas they have been mapped as kame phases. Generally, the areas are irregular and somewhat steeper than those of the typical soils on the till plain.

The soils of the Fox series are in the same catena as the Homer soils, which are somewhat poorly drained. They are in the Gray-Brown Podzolic great soil group.

Profile of Fox loam:

A_1 0 to 4 inches, brown to dark-brown (10YR 4/3) loam; fine, granular structure; friable; medium content of organic matter; slightly acid.

A_2 4 to 12 inches, brown (10YR 5/3) loam; fine, granular structure; friable; contains many roots; slightly acid to medium acid.

B_1 12 to 18 inches, brown (7.5YR 4/4), light clay loam; fine, granular structure; slightly plastic when wet, and hard when dry; medium acid.

B_2 18 to 33 inches, brown (7.5YR 5/4) to reddish-brown (5YR 4/4) gravelly clay loam; angular blocky structure; plastic when wet, and hard when dry; contains many large pebbles; medium acid to slightly acid.

B_{22} 33 to 38 inches, dark reddish-brown (5YR 3/3) to dark-brown (7.5YR 4/4) gravelly clay loam; weak, coarse, subangular blocky structure; somewhat plastic when wet; contains fragments of limestone in many places; slightly acid; grades abruptly to gravel.

D 38 inches +, pale-brown (10YR 6/3), loose, stratified, sand and gravel; contains much limestone; calcareous.

The soils vary in the thickness of horizons and in the depth to calcareous gravel and sand; the surface layers and the subsoils vary in texture and acidity. In sloping areas the soils are coarser textured than the profile described and have more gravel throughout. In the steeper soils, the depth to calcareous material is 24 inches or less.

In some areas the Fox soils grade to Ockley soils. Here, the loamy material, or overburden, is deeper than in the typical soil and the depth to calcareous gravel and sand is about 42 inches or more. In other areas, where the Fox soils grade to Nineveh soils, the color is darker than that of the typical soil and the reaction is nearly neutral.

Fox loam, 0 to 2 percent slopes (FmA).—The profile of this soil is the same as that described for the series. This soil occupies small areas throughout the valley of the west fork of the Whitewater River in Fayette County; a few areas also occur along the east fork of the Whitewater River in southern Union County.

The texture of the surface layer ranges from gritty silt loam or heavy loam to loose, mellow loam; particles of sand and some pebbles are mixed with the soil material. The soil is medium acid to slightly acid. In a few places it is sandier throughout than the normal soil and is leached of calcium carbonate to depths of 42 inches or more. In areas where the soil grades to Nineveh and Rodman soils, the reaction is neutral.

In cultivated areas the surface layer is yellowish brown to dark brown and is about 10 inches thick. The soil is loose and granular if it is cultivated, and the organic matter oxidizes rapidly. Consequently, the content of organic matter is low if the soil has been cultivated.

Mapped with this soil are a few areas of Mill Creek loam, which is not mapped separately in these counties. This included soil is underlain by a mixture of silt loam and gravel.

Most Fox loam, 0 to 2 percent slopes, has been cleared and is used for crops and pasture. Generally, a grain-livestock type of farming is practiced. The medium to low supply of moisture makes the soil poorly suited to oats, and drought sometimes damages corn. The soil is best suited to wheat and rye and other small grains that are sown in fall and that mature before the dry summer months. Kentucky bluegrass makes excellent pasture but is dormant during July and August. It is best, therefore, to seed rotation meadows to a mixture of alfalfa and grass, or to provide supplementary pastures of sudangrass.

This soil requires practices that will maintain and increase the content of organic matter and the supply of moisture. Cover crops and green-manure crops should be turned under. In addition, hay and pasture crops are desirable, especially alfalfa and other deep-rooted legumes that are able to reach the limited supply of moisture. (Management group 4A.)

Fox loam, 2 to 6 percent slopes, slightly eroded (FmB1).—The profile of this soil is similar to that of Fox loam, 0 to 2 percent slopes, but much of this soil is slightly eroded. Its surface layer is generally 8 to 10 inches thick. This soil is on short slopes along drainageways.

This soil can be used and managed about the same as Fox loam, 0 to 2 percent slopes. Droughtiness is the main problem in using it. The droughtiness is made more serious because much of the rainfall is lost through runoff. Tilling on the contour, wherever feasible, will help to reduce runoff and erosion. (Management group 4B.)

Fox loam, 2 to 6 percent slopes, moderately eroded (FmB2).—The profile of this soil is similar to that of Fox loam, 0 to 2 percent slopes, but the surface layer is only 3 to 8 inches thick. Also, runoff is a more serious problem. In the more severely eroded areas, tillage has mixed part of the lighter colored clay loam of the subsoil with the dark-colored surface soil. In these areas the present surface layer is now less permeable than the original one and runoff is even more serious than in less eroded areas.

Droughtiness is the principal limiting factor in using this soil. It becomes more pronounced as erosion progresses. The soil is too erodible to cultivate intensively; clean-tilled crops should be grown less of the time than grasses and legumes. If cultivated, the soil should be tilled on the contour. Yields of most crops are slightly lower than on Fox loam, 0 to 2 percent slopes. (Management group 4C.)

Fox loam, 6 to 12 percent slopes, moderately eroded (FmC2).—The profile of this soil is similar to that of Fox loam, 0 to 2 percent slopes. The surface layer is only 3 to 8 inches thick, however, and the depth to gravel and sand is generally less. In many small areas, especially on the steeper slopes, the subsoil is exposed. The subsoil is a reddish-brown gravelly clay loam.

This soil is shallow and is underlain by coarse-textured material. It is droughty and has rapid runoff. Where the heavy-textured subsoil is exposed, less moisture is available to crops than where some of the original surface soil remains.

If cultivated, this soil is likely to become severely eroded. It can be protected by using it for pasture or timber. Tilling on the contour and using a cropping system in which there is a higher proportion of small grains and hay crops than clean-tilled crops will help to control erosion and maintain yields. Tillage implements can be used to cultivate across the short slopes. Many of the areas are small. Therefore, the use of this soil is generally determined by the use of the adjacent soils. A suggested cropping system consists of 1 year each of corn and wheat, and then the soil should be used for alfalfa-bromegrass meadow for 2 or 3 years. (Management group 4D.)

Fox silt loam, 0 to 2 percent slopes (FnA).—The profile of this soil is similar to that of Fox loam, 0 to 2 percent slopes, but the texture of the surface layer is silt loam and that in the upper part of the subsoil is silty clay loam. In addition, the depth to calcareous gravel and sand is slightly greater. The soil is nearly level to slightly undulating. It occurs on terraces at elevations that are generally less than 10 feet above the flood plain. Some areas are in depressions. In many of these depressions, there are some colluvial deposits.

Surface runoff is very slow, but internal drainage is medium, even in the shallow depressions. The silty clay loam in the subsoil is fairly free of gravel to depths of about 15 to 18 inches, but the content of sand and gravel increases with increasing depth. Unless lime has been added, the surface soil and subsoil are medium acid.

The color and texture of the surface soil vary somewhat. The depth to calcareous gravel and sand ranges from 30 to 44 inches. In a few places considerable silt is mixed with the gravel and sand.

Most of this soil has been cultivated, but its use is limited to some extent by droughtiness. The moisture-supplying capacity is somewhat limited but is not so limited as in the Fox loams. Corn, soybeans, wheat, and grasses and legumes grown together are the crops most commonly grown. Vegetables and small fruits, grown for commercial use on a few acres, make fair to good yields. A few areas are in forests consisting chiefly of various kinds of oak and maple.

This soil is used and managed about the same as Fox loam, 0 to 2 percent slopes, but yields are better. The cropping system generally used consists of corn, wheat, and clover or alfalfa. The soil is better suited to wheat than to oats, and wheat is grown more frequently. Alfalfa grows better than clover, which is sometimes damaged by drought. Yields of crops are lowered in years of little rainfall. (Management group 4A.)

Fox silt loam, 2 to 6 percent slopes, slightly eroded (FnB1).—This soil is similar to Fox silt loam, 0 to 2 percent slopes, but it has stronger slopes and tends to erode because of the more rapid runoff. The surface layer is 8 to 12 inches thick. This soil occurs along drainageways and in shallow depressions and swales.

On the steeper slopes are many small areas in which the soil is more severely eroded than normal. In these areas plowing has mixed part of the reddish-brown clay loam of the subsoil with the surface soil. Here, the surface soil has a lighter color and is more cloddy than the typical soil. In a few places the gravelly substratum contains more silt and other fine material than normal.

The main problem in managing this soil is the limited supply of available moisture, but erosion is a problem in some areas. Tilling on the contour and growing cover crops will help to reduce runoff and control erosion. Use grassed waterways where feasible. Choose a cropping system that has more meadow crops than clean-tilled crops. (Management group 4B.)

Fox silt loam, 2 to 6 percent slopes, moderately eroded (FnB2).—The profile of this soil is similar to that of Fox silt loam, 0 to 2 percent slopes, but it has a thinner surface layer. The surface layer is 3 to 8 inches thick. Some areas are more severely eroded than normal. In these, tillage has mixed part of the reddish-brown subsoil with the remaining dark-colored surface soil. The present plow layer in these areas is generally cloddy and makes a poor seedbed.

This soil is droughty, but erosion is the principal management problem. If erosion is not checked, the supply of moisture available for crops becomes more critical. The soil can be managed about the same as Fox silt loam, 2 to 6 percent slopes, slightly eroded. It must be managed more carefully, however, to prevent erosion. Add larger amounts of manure and commercial fertilizer, and apply adequate lime. In addition, till on the contour and use a cropping system that consists largely of meadow and small grains rather than clean-tilled crops. (Management group 4C.)

Fox silt loam, 6 to 12 percent slopes, moderately eroded (FnC2).—This soil is on short slopes on terrace escarpments. Its profile is similar to that of Fox silt loam, 0 to 2 percent slopes, but the surface layer is generally only 3 to 8 inches thick. In some places erosion has removed most of the original surface soil and tillage has mixed part of the reddish-brown subsoil with the remaining dark-colored surface soil.

This soil is cropped less extensively than Fox silt loam, 0 to 2 percent slopes. When it has been used for crops, many severely eroded areas have been allowed to revert to grass after yields declined. The soil occurs mainly in small areas; therefore, it is generally used the same as adjoining soils.

This soil is better suited to alfalfa or to wheat and other small grains that are sown in fall than to clean-tilled crops. Clean-tilled crops should be grown only in the areas where erosion can be controlled. Tillage needs to be on the contour. (Management group 4D.)

Fox soils, 6 to 12 percent slopes, severely eroded (FpC3).—These soils occupy many small areas on the breaks of terraces. Most of them, however, are on longer slopes on the higher terraces near the Ockley soils. The texture of the original surface soil ranged from silt loam to fine sandy loam, but most of the original surface soil has been lost through erosion. The present surface soil is yellowish-brown (10YR 5/6) to brown (7.5YR 4/4), heavy loam or clay loam. The content of organic matter is very low.

These soils are low in ability to supply moisture, and they generally have poor tilth. If tilled, they erode readily. When they erode, the supply of moisture is further reduced, the content of organic matter and the supply of plant nutrients is lowered, and the soils become harder to work. These soils are better suited to alfalfa and to fall-seeded small grains than to row crops. If corn is grown, practices must be used to prevent further erosion.

Most of these soils occur within areas of Fox loam, 6 to 12 percent slopes, moderately eroded, and are used for similar crops. The yields are low. To prevent further erosion and the resulting lower yields, use practices to control erosion and to build up the supply of plant nutrients. (Management group 4E.)

Fox silt loam, 12 to 18 percent slopes, slightly eroded (FnD1).—The profile of this soil is similar to that of Fox silt loam, 0 to 2 percent slopes, but the surface layer is only 8 to 12 inches thick and the depth to calcareous gravel and sand is generally less. Runoff is rapid; the risk of erosion is serious.

Droughtiness and the risk of erosion limit the use of this soil. Most of the areas have been kept under a protective cover of grass or timber. If cultivated, the soil is likely to erode. It will then lose much of its supply of plant nutrients, and yields will be low.

Much of this soil is too steep to till. The soil is better suited to alfalfa or permanent pasture than to row crops. If good management is used, however, row crops can be grown occasionally. Keeping the soil in permanent pasture or trees will help to prevent erosion. (Management group 4F.)

Fox silt loam, 12 to 18 percent slopes, moderately eroded (FnD2).—The profile of this soil is similar to that of Fox silt loam, 0 to 2 percent slopes, but the surface layer is thinner and the depth to calcareous gravel and sand is generally less. The surface layer is 3 to 8 inches thick. Runoff is rapid, and the risk of erosion is serious. In many places erosion has been so severe that the subsoil is exposed.

The use of this soil is limited by droughtiness and by the risk of erosion. If cultivated, the soil is likely to erode, and it then loses much of its supply of plant nutrients. As erosion becomes more severe, yields decline.

Most of this soil is too steep to till. It is better suited to alfalfa or to permanent pasture than to row crops. If well managed, however, row crops can be grown occasionally. Keeping the soil in permanent pasture or trees will help to prevent erosion. (Management group 4F.)

Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded (FoB2).—The profile of this soil is similar to that of Fox silt loam, 0 to 2 percent slopes, but this soil occurs on conical knolls, or kames, on the winding ridges of moraines (fig. 5). The slopes vary in direction and in length. The soil occurs near the Russell and Miami soils.

Some small areas of this soil are only slightly eroded, but others are severely eroded. In many places the texture of the soil is more loamy than that of the typical soil.

The use of this soil is limited mainly by droughtiness and by the risk of erosion. The soil can be used and managed the same as Fox silt loam, 2 to 6 percent slopes, moderately eroded. Because of the irregular slopes, however, it is hard to till on the contour or to apply other practices to control erosion. To help control erosion, maintain a cover of plants and limit the growing of clean-tilled crops. (Management group 4C.)

Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded (FoC2).—Erosion has caused this soil to vary in texture. It has also caused it to vary in the thickness of horizons and in depth to limy gravel and sand.

The soil is limited in use by droughtiness and by the risk of erosion. Its slopes are so irregular that it is not feasible to till the soil on the contour. If clean-tilled crops are grown, terracing or stripcropping will be needed. The soil is well suited to wheat and alfalfa. These crops provide a cover and thus retard erosion. Because of declining yields, much of the soil has reverted to pasture of poor quality. (Management group 4D.)

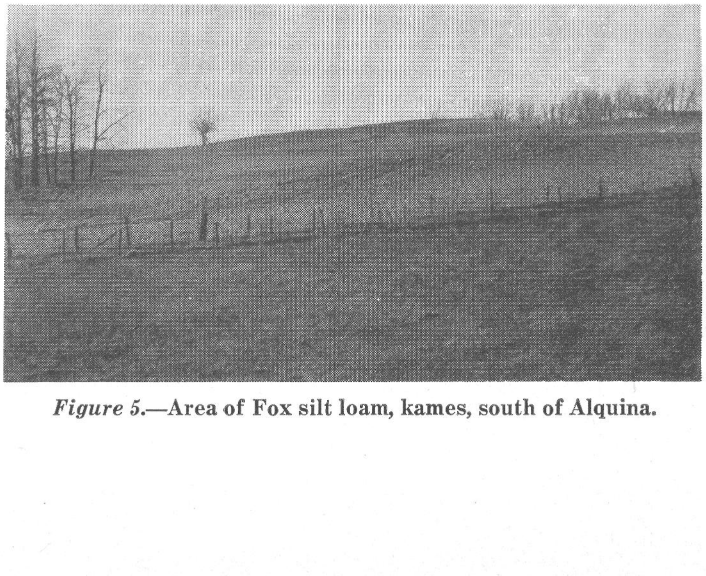

Figure 5.—**Area of Fox silt loam, kames, south of Alquina.**

Fox soils, kames, 6 to 12 percent slopes, severely eroded (FrC3).—These soils are more eroded than Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded, but are otherwise similar. The present plow layer is reddish-brown, heavy loam to gravelly clay loam.

The use of these soils is limited by droughtiness and by the risk of erosion. The soils are not suited to corn and other clean-tilled crops. They are best used for alfalfa and other meadow crops that are grown over a long period. Wheat and other small grains can be grown occasionally. (Management group 4E.)

Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded (FtD2).—These soils are on knolls and ridges near Russell soils and near other Fox soils on kames. The slopes vary in shape and in length and direction within short distances. The soils also vary greatly in depth to gravel and sand. Fox and Rodman loams are made up of light-colored Fox soils and dark-colored Rodman soils. Some small areas of Russell soils are mapped with these soils.

These soils have lost much of the original surface soil through erosion. The present plow layer ranges from dark-brown or brown loam to yellowish-brown clay loam, depending on the severity of erosion and on the amount of subsoil mixed with the surface soil.

The use of the soils is limited by the steep slopes, by droughtiness, and by erodibility. Some of the soils on less sloping areas can be used for limited cropping and pasture. The soils on the steeper slopes are better suited to permanent pasture or trees. (Management group 4F.)

Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded (FtE2).—This mapping unit is similar to Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded. The soils can be used and managed in about the same way. (Management group 4G.)

Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded (FxD3).—This mapping unit is similar to Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded. The soils can be used and managed in about the same way. (Management group 4F.)

Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded (FsD2).—These soils are similar to Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded. The present surface soil varies; in areas where the Fox soil occurs, the surface soil is grayish-brown loam to yellowish-brown gravelly clay loam; in areas where the Rodman soil occurs, the surface soil is very dark brown gravelly clay loam. Erosion has also caused the texture of the surface soil to vary. In areas where much of the original surface soil has been removed through erosion, the texture differs from that in the original surface layer. The depth to loose gravel and sand is generally less than 30 inches. Some small areas have many gullies; others, have slopes of more than 25 percent. The soils occur near the Fox soils, which are on nearly level alluvial terraces.

These soils can be used about the same as Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded. Their management is also the same. (Management group 4F.)

Fox and Rodman soils, 12 to 18 percent slopes, severely eroded (FvD3).—These soils are similar to Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded. They can be used and managed in about the same way. (Management group 4F.)

Genesee Series

The Genesee soils are well drained and are neutral to calcareous. They occur on bottom lands along streams. The sandier Genesee soils are generally on natural levees, and the finer textured ones are on back bottoms. The soils have formed in materials that were washed from soils on forested uplands and terraces where the parent material was glacial drift of Wisconsin age. The native vegetation was a dense forest of sycamore, soft maple, elm, ash, cottonwood, and tulip trees. Most of the areas have been cleared.

These soils are in the same catena as the moderately well drained Eel soils of the shallow swales and old meander channels. This catena also includes the somewhat poorly drained Shoals soils of the deeper swales and abandoned stream channels and the very poorly drained, dark-colored Sloan soils of the marshy bottom lands and seep areas. The Genesee soils are in the Alluvial great soil group.

The Genesee soils are likely to be covered by water from late in fall to early in summer. The areas receive fresh deposits laid down by floodwaters. As a result, the texture and characteristics of the soil materials may change radically, sometimes during one flood. In places soil is lost when new channels cut through unprotected streambanks.

The soils on some of the higher areas are seldom flooded. In these areas the stream may have changed its course or cut its channel deep enough so that the areas are no longer flooded each year. Here, the soils have been in place long enough to show some soil development. They have been mapped as high bottom phases.

Profile of Genesee silt loam (NW¼SW¼ sec. 32, T. 15 N., R. 13 E., Fayette County, Ind.):

A_p 0 to 8 inches, brown (10YR 5/3, dry or 7.5YR 4/2, dry) to dark-brown (10YR 3/3) silt loam; moderate, fine to medium, granular structure; friable when moist, but slightly sticky when wet; moderately high content of organic matter; neutral to slightly calcareous.

C_1 8 to 14 inches, dark yellowish-brown (10YR 3/4, dry) silt loam; moderate, medium, subangular blocky structure; friable when moist, but sticky when wet; calcareous.

C_2 14 to 24 inches, dark yellowish-brown (10YR 4/4, moist) silt loam; moderate, medium, subangular blocky structure; friable when moist, but sticky when wet; calcareous.

C_3 24 to 32 inches +, yellowish-brown (10YR 5/4, moist) loam; weak, medium, blocky structure; calcareous.

The texture of the soil varies markedly throughout the profile, and it also varies from place to place within short distances. In areas where the surface soil is lighter textured than that of the normal soil, the subsoil and substratum are also generally lighter textured than normal. In most areas the texture changes periodically because of the deposits laid down by floods. The high bottom soils are similar to the normal soil. In places, however, they are slightly acid and show weak textural and structural development in the B horizon.

Genesee silt loam (Gs).—The profile of this soil is the same as the profile described for the series. Most of the soil is nearly level, but in places along old stream channels and bayous it has slopes of 3 percent or more.

Mapped with this soil are a few small areas that have a slightly heavier texture than the normal soil. The plow layer of this included soil is a silty clay loam that tends to be cloddy. Good yields are obtained on these areas.

The use of Genesee silt loam is determined mainly by the size of the field, by the suitability of the area for tillage, and by the risk of overflow. Along the larger streams trees have been left to help protect the banks from cutting and to help prevent the streams from changing course. Most of the large areas of bottom lands along these streams are used for crops. These areas are flooded, however, nearly every winter and every third or fourth summer. The floods generally destroy fall-seeded small grains and damage meadow crops. Consequently, it is not feasible to use a consistent cropping system. Corn and soybeans can be planted and harvested in summer when floods are less likely to occur, and they are grown more commonly than other crops. Wheat, alfalfa, red clover, and other fall-seeded crops can be grown only on the higher natural levees where the floodwaters recede rapidly.

Along tributary streams the areas are generally narrow. They are too small and irregular for the use of machinery to be feasible. Therefore, these bottom lands are used mostly for permanent pasture or as woodland. (Management group 7A.)

Genesee silt loam, high bottom (Gt).—The profile of this soil is similar to that of Genesee silt loam, but the subsoil is slightly acid and has a slightly heavier texture and a blocky structure. The soil is nearly level, but in a few places near the larger streams the slopes are 3 percent or more.

Most of this soil is cultivated. Generally, a definite cropping system is used, but corn and soybeans are the principal crops grown. Oats, wheat, and alfalfa are grown more frequently than on Genesee silt loam. (Management group 7A.)

Genesee loam (Gm).—This soil has formed in neutral to slightly calcareous alluvium. Its profile is similar to that of Genesee silt loam, but the surface layer has a loamy texture and is lighter colored, and the subsoil is generally somewhat lighter textured. In addition, this soil is sandier and the texture is more variable throughout. Therefore, the capacity to hold moisture available is lower.

Most of this soil is cultivated. The principal crops are corn, soybeans, wheat, sweetclover, alfalfa, and sweet corn. The soil is well suited to corn and soybeans. Yields are about the same, or slightly lower, than on Genesee silt loam. (Management group 7A.)

Genesee loam, high bottom (Go).—The profile of this soil is similar to that of Genesee loam. The areas are 2 to 5 feet above the bottoms, however, and are less likely to be flooded. In a few places the soil is underlain by gravel and sand that is at depths of 3 to 4 feet. In places, the slopes into old stream channels range from 2 to 15 percent; these slopes are generally short and have little effect on the use of the soil.

This soil is used more intensively for tilled crops than Genesee loam. The crops most commonly grown are corn, wheat, soybeans, and alfalfa. Flooding is less likely to cause losses of crops than on Genesee loam. Therefore, it is more feasible to use a cropping system that includes fall-seeded crops. In contrast to the Genesee soils in lower areas, little fertile soil material is deposited on this soil by floods. Therefore, this soil requires more care to maintain its productivity. (Management group 7A.)

Genesee gravelly loam (Gg).—This soil has small amounts of gravel in places throughout the profile, but its profile is otherwise similar to that of Genesee silt loam. It occurs on natural levees and on washout deposits along streams in the bottom lands.

This soil has a surface layer, 8 to 10 inches thick, that consists of light yellowish-brown (10YR 6/4) to brown (10YR 5/3) gravelly loam. The content of organic matter is fairly low. Loose sand and gravel, and in places slabs of rock, generally occur at depths of about 24 inches.

In some places the coarse-textured substratum contains considerable silt and other fine material; here, the soil has a fairly good capacity for holding moisture available. In many of the areas, the soil grades to the deep Genesee soils nearby.

Most of this soil is somewhat droughty and is not well suited to crops. The areas are generally too small to be used alone. They are used to grow corn, wheat, clover, and alfalfa, but yields are low. The areas of this soil that are large enough to manage separately are well suited to alfalfa. The alfalfa is better able than most crops to use the somewhat limited and variable supply of moisture. A small acreage is in pasture and woodland of low quality. (Management group 7A.)

Genesee fine sandy loam (Ge).—This soil has formed in neutral to slightly alkaline alluvium. It occurs with Genesee loam on slight rises or natural levees that adjoin streams. The soil is subject to overflow, but the water drains off quickly without damage to crops.

The surface soil in cultivated fields is light yellowish-brown (10YR 6/4) to brown (10YR 5/3) fine sandy loam, about 12 inches thick. The soil is mildly alkaline or calcareous. In some places gravel is mixed with the soil, and there are thin layers of loamy or silty materials. In places the soil is deep and sandy, and in some small areas it is nearly as coarse textured as Riverwash. In such places corn and other crops that require a large amount of moisture may be damaged in dry seasons. In a few places, where the soil lies at a little higher elevation than normal, it is less likely to be flooded.

This soil is somewhat droughty. It is not well suited to continuous row crops. Yields of corn, wheat, clover, and alfalfa are lower than the yields obtained on Genesee loam. Oats, soybeans, and corn are likely to be damaged by lack of moisture. Alfalfa and, to some extent, wheat are better able to use the available moisture in the soil. (Management group 7A.)

Gravel Pits

Gravel pits (Gv).—This mapping unit consists of areas in which gravel has been removed for industrial and agricultural use. Generally, the pits are in areas that formerly were occupied by Fox or Ockley soils. The size of the pits varies. In some places gravel has been removed to depths below the level of the permanent water table. In such places ponds have formed.

Worked-out gravel pits have little use. Some can be used as dumps for refuse. Others can be used for pasture or as woodland, but their potential value is low. This mapping unit has not been placed in a management group.

Hennepin Series

The Hennepin soils are shallow and are excessively drained. They are steep to very steep. Most of them are adjacent to the larger streams near steep soils of the Russell series.

Because of the steep slopes, the soil materials have been washed away almost as fast as they have accumulated. Consequently, the soils have a thin solum. Little development has taken place in the profile, and little clay has accumulated in the subsoil. The Hennepin soils are in the Regosol great soil group but intergrade to Gray-Brown Podzolic soils.

Profile of Hennepin loam in a wooded area (SW¼NE½ sec. 24, T. 14 N., R. 11 E., Fayette County, Ind.):

A_{11} 0 to 1 inch, dark grayish-brown (10YR 4/2) loam; moderate, fine, granular structure; nonplastic when wet; moderate content of organic matter; neutral.

A_{12} 1 to 5 inches, pale-brown (10YR 6/3) silt loam to loam; moderate, fine, granular structure; nonplastic when wet; slightly acid to neutral.

B_1 5 to 12 inches, pale-brown (10YR 6/3) to yellowish-brown (10YR 5/4) loam to light clay loam; medium, subangular blocky structure; firm when moist, slightly plastic when wet, and hard when dry; neutral to mildly alkaline.

C 12 inches +, light yellowish-brown (10YR 6/4) loam till; weak, medium, subangular blocky structure; friable to compact when moist, and nonplastic when wet; calcareous.

The color and thickness of the surface soil varies. The texture of the surface soil ranges from silt loam in the less eroded areas to loam in the more eroded and steep areas. In places the soils resemble Miami soils. In these places the soils have slopes of 20 to 30 percent, the solum is 1 to 2 feet deep, and the subsoil is medium acid. The soils on the steeper slopes are generally more eroded than in less sloping areas, and in most places the calcareous drift is near the surface.

Hennepin loam, 25 to 35 percent slopes, slightly eroded (HeF1).—The profile is similar to the one described for the series. In places it resembles the profile of Miami soils in having a solum 1 to 2 feet thick and a medium acid subsoil. In such places this soil has slopes of 20 to 30 percent.

This soil is not suited to cultivated crops; it erodes easily and needs a cover of plants. It is well suited to bluegrass and to timber.

Areas that have already been cleared are probably best used for permanent pasture, providing the slopes are favorable and grazing is controlled. If the sod in these pastures is thin, it can be improved by growing legumes. The steeper and more eroded areas have enough plant nutrients for hardwoods to grow, and the soil is probably best suited to them. The reaction is neutral or alkaline, and, therefore, evergreens do not grow well. (Management group 3C.)

Hennepin loam, 25 to 35 percent slopes, moderately eroded (HeF2).—This soil is similar to Hennepin loam, 25 to 35 percent slopes, slightly eroded, but has lost more of the surface soil through erosion. It can be used and managed in about the same way. (Management group 3C.)

Hennepin loam, 35 to 50 percent slopes, slightly eroded (HeG1).—This soil has steeper slopes and thinner layers than Hennepin loam, 25 to 35 percent slopes, slightly eroded. It is otherwise similar.

This soil is not suited to crops. Forested areas should be kept in trees, and areas that have already been cleared should be reforested unless the need for pasture is critical. Pastures produce moderate yields on the less steep areas if they are fertilized and mowed and if grazing is controlled. The soil is probably best suited to hardwoods; evergreens do not grow well because the soil is alkaline. (Management group 3D.)

Hennepin loam, 35 to 50 percent slopes, moderately eroded (HeG2).—This soil is more eroded than Hennepin loam, 35 to 50 percent slopes, slightly eroded, but its profile is otherwise similar. It can be used and managed about the same. (Management group 3D.)

Homer Series

The Homer soils are somewhat poorly drained. They are in nearly level areas or in slight depressions. They occur on low alluvial terraces in the valleys of old streams formed by the melt water of glaciers. The native vegetation was mainly beech, maple, sycamore, ash, elm, oak, and other water-tolerant trees. During wet seasons the water table is near the surface. Consequently, surface runoff and internal drainage are slow. Most areas are now drained by open ditches.

These soils are in the same catena as the Fox soils, which are well drained to excessively drained. They are intermediate in position between the Fox and Westland soils. The Homer soils are in the Gray-Brown Podzolic great soil group. Only one soil of this series, Homer silt loam, occurs in Fayette and Union Counties.

Profile of Homer silt loam in a cultivated field (Fayette County, Ind.):

A_p 0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine, granular structure; nonplastic when wet; moderate content of organic matter; slightly acid.

A_2 7 to 11 inches, light brownish-gray (10YR 6/2) silt loam; moderate, fine, granular structure; nonplastic when wet; low content of organic matter; medium acid.

B_1 11 to 14 inches, pale-brown (10YR 6/3) silt loam mottled with dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; nonplastic when wet; medium acid.

B_{21} 14 to 32 inches, dark-gray (10YR 4/1) silty clay loam mottled with brownish yellow (10YR 6/6); strong, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid.

B_{22} 32 to 38 inches, dark-brown (10YR 4/3), light silty clay loam to clay loam; moderate, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; neutral.

D 38 inches +, light yellowish-brown (10YR 6/4), loose, stratified sand and gravel; calcareous.

The soils vary in color and texture and in the thickness of the horizons. The depth to mottling ranges from 6 to 14 inches, and depth to calcareous gravel and sand, from 36 to 46 inches. The amount of gravel in the subsoil also varies, but it generally is somewhat less than in the Fox soils.

In some places the soils have slopes of 2 to 4 percent. In a few places the soil contains enough sand to have a loamy texture. In some areas the water table is somewhat deeper than normal. Here, the subsoil is generally yellowish brown and is mottled at depths of 15 to 18 inches.

Homer silt loam (Ho).—The profile of this soil is the same as that described for the series.

The use of this soil is limited by excess water. Generally, adequate drainage can be provided by draining adjoining areas of Westland soil. If adequate drainage is provided, alfalfa, clover, and other deep-rooted crops will help to keep organic matter in the surface layer. In addition, the roots of these crops penetrate the subsoil and help to make it more porous.

The cropping system generally used consists of corn, wheat or oats, soybeans, and mixed hay crops including alfalfa, clover, alsike, and timothy. Yields of corn depend largely upon whether drainage is adequate, upon the weather, and upon the supply of plant nutrients in the soil. In areas that border or are farmed with the Westland soil, corn is often grown for several years in succession. Wheat and alfalfa are sometimes damaged in winter and in spring by excess water and by frost heaving, particularly in areas that are undrained.

If alfalfa and clover are to be grown, adequate lime must be added. A small acreage is in permanent pasture of fair quality. The pastures can be improved by applying lime, potash, and phosphate and by controlling the weeds. A few acres are in timber. (Management group 5A.)

Kokomo Series

The soils of the Kokomo series are very dark colored and are very poorly drained. They occupy small areas in the deeper depressions and swales throughout the Wisconsin till plain. These soils have formed from highly calcareous glacial till of Wisconsin age. The native vegetation was a swamp forest made up of marsh grasses and water-tolerant trees.

The Kokomo soils occur with the Brookston and Cope soils. They have more organic matter in the surface layer and in the upper part of the subsoil than the Brookston soils, their A_{12} horizon is thicker, and their B_{21g} layer is predominantly gray rather than mottled. The Kokomo soils are in the Humic Gley great soil group. Only one soil of this series, Kokomo silty clay loam, occurs in Fayette and Union Counties.

Profile of Kokomo silty clay loam in a cultivated area:

A_p 0 to 6 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silty clay loam; weak, coarse, granular structure; firm when moist; slightly hard when dry, and shrinks and develops cracks 1 to 3 inches wide; neutral.

A_{12} 6 to 18 inches, very dark gray (10YR 3/1) silty clay loam; high in content of organic matter; moderate, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; neutral.

B_{21g} 18 to 26 inches, gray (10YR 5/1), heavy silty clay loam to light silty clay; a few, faint, yellowish-brown (10YR 5/4) mottles in lower part; moderate, coarse, blocky structure to weak, prismatic structure; very firm when moist, sticky and plastic when wet, and very hard when dry; neutral.

B_{22g} 26 to 46 inches, mottled gray (10YR 5/1) and yellowish-brown (10YR 5/4) silty clay loam to light silty clay; moderate, very coarse, blocky structure; very firm when moist, sticky and very plastic when wet, and very hard when dry; neutral to mildly alkaline.

C 46 inches +, mottled gray (10YR 5/1) and yellow (10YR 7/6) loam to coarse clay loam glacial till; calcareous.

In places there is much sand and gravel in the subsoil and substratum. The soils vary in the thickness of horizons and in the depth to calcareous material. In areas where the soils occur near the soils of the Miami catena, they are less acid and the depth to calcareous till is shallower than in the soils that are near those of the Russell catena.

Kokomo silty clay loam (Ko).—The profile of this soil is like that described for the series. The soil occurs near soils of the Miami and Russell catenas. Most of it is in Fayette County.

In many places this soil is lighter textured than the normal soil and grades to a light silty clay loam. In the deeper depressions, known locally as gumbo spots, the texture is finer than normal. In these areas the soil is hard to work and is difficult to keep in good tilth.

The use of this soil is limited mainly by wetness. The soil is also likely to be deficient in potassium. If adequately drained, it can be used about the same as Brookston silty clay loam. Yields of corn are sometimes higher than on the Brookston soil, but the average yield is lower because water ponds more frequently on this soil and drowns out the crop. Oats, wheat, clover, and alfalfa are also grown but are frequently winterkilled or drowned out. Areas that are not feasible to drain are best used for pasture.

Crops, particularly corn and soybeans, are likely to be damaged by lack of potassium. The soil is more likely to be deficient in potassium in areas where it has a high content of organic matter and is somewhat "chaffy" than elsewhere. Because of the poor aeration and heavy texture of the subsoil, it is hard for roots to penetrate and use the supply of plant nutrients. (Management group 6A.)

Lake Beach

Lake beach (La).—This miscellaneous land type consists of beaches that surround the manmade lake in Whitewater State Park. The beaches were built up artificially for recreational purposes and are similar to the natural beaches in the northern part of the State. This miscellaneous land type has not been placed in a management group.

Made Land

Made land (Ma).—This miscellaneous land type is made up of areas that have been filled with refuse and then covered with a thin layer of soil. The areas were formerly borrow pits, or gravel pits, or occurred in depressions, along drainage ditches, and on bottom lands.

Most of the areas are used as building sites. Some of the areas, particularly those along drainage ditches, can be used for crops. This miscellaneous land type has not been placed in a management group.

Manlove Series

The Manlove soils are well drained. They are nearly level or have gentle slopes. In many places the slopes are long. These soils occur in small areas on the glacial till plains and on nearby moraines throughout Fayette and Union Counties. They have formed in a layer of loess, 3 to 5 feet thick, that overlies highly calcareous glacial till of early Wisconsin age. The native vegetation was maple, beech, walnut, oak, and other deciduous hardwoods.

These soils are in the same catena as the moderately well drained Birkbeck soils and the somewhat poorly drained Reesville soils. Their parent material is similar to that of the Russell soils, but the loess in which the Manlove soils formed is thicker and the depth to calcareous till is greater. The Manlove soils are in the Gray-Brown Podzolic great soil group.

Profile of Manlove silt loam:

A_p 0 to 5 inches, pale-brown (10YR 6/3) to light yellowish-brown (10YR 6/4, dry), smooth silt loam; moderate, fine, granular structure; friable when moist, but slightly sticky when wet; has a fairly low content of organic matter; slightly acid.

A_2 5 to 12 inches, light yellowish-brown (10YR 6/4), smooth silt loam; moderate, fine, granular structure to platy structure; friable when moist, but sticky when wet; medium to slightly acid.

B_1 12 to 17 inches, yellowish-brown (10YR 5/6, dry), smooth, heavy silt loam; moderate, medium, subangular blocky structure; plastic and sticky when wet; very low content of organic matter; medium acid.

B_2 17 to 32 inches, dark yellowish-brown (10YR 4/4), smooth silty clay loam; moderate, medium, subangular blocky structure; plastic and sticky when wet, and hard when dry; medium to strongly acid.

B_3 32 to 45 inches, dark yellowish-brown (10YR 4/4), light silty clay loam to heavy silt loam; weak, medium to coarse, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid.

C_1 45 to 65 inches, light yellowish-brown (10YR 6/4) silt loam; common, fine, distinct mottles of dark reddish brown (5YR 3/4) and dark brown (7.5YR 4/4); vesicles lined with iron-manganese oxides; some grit in lower part of horizon; weak, coarse, blocky structure; slightly plastic when wet, and hard when dry; slightly acid to mildly alkaline.

D 65 inches +, yellowish-brown (10YR 5/8) loamy till; weak, coarse, blocky structure; calcareous.

The thickness of the loess ranges from 36 to about 60 inches. The depth to calcareous till ranges from 40 to 70 inches. In areas where the deposit of loess is thinner than in the profile described, the carbonates are likely to be leached out of the soil. Also, the carbonates are more likely to be leached out of the soil in areas that have steep slopes than in areas that are more nearly level.

Manlove silt loam, 0 to 2 percent slopes (MbA).—The profile of this soil is the same as that described for the series. The soil is deep. It is productive and has no serious limitations. In places on the longer slopes, however, there is a slight risk of erosion.

This soil is suited to all the crops commonly grown in the area. Most of it is used for general farm crops. Generally, the cropping system consists of 1 year each of corn and a small grain and 1 or 2 years of meadow. If necessary, corn can be grown for 2 or more years in succession.

This soil needs nitrogen and phosphate, particularly if corn, oats, or wheat is to be grown. It does not have enough potassium for soybeans and alfalfa to grow well. The soil also needs lime for alfalfa and other legumes. Applying large amounts of fertilizer and lime according to the needs indicated by soil tests and using a suitable cropping system will help to correct deficiencies. In addition, the content of organic matter will be replenished and yields increased. (Management group 1A.)

Manlove silt loam, 2 to 6 percent slopes, slightly eroded (MbB1).—The profile of this soil is similar to that of Manlove silt loam, 0 to 2 percent slopes, but the surface layer is only 8 to 12 inches thick. In a few small areas, where the soil is more sloping or more severely eroded than normal, the yellowish-brown subsoil is exposed.

This soil is likely to erode if it is cropped intensively. Therefore, if row crops are grown, tilling on the contour, stripcropping, terracing, and use of other suitable practices to prevent erosion are needed. In addition, a cropping system should be used that includes a legume grown for hay. Yields are about the same as those obtained on Manlove silt loam, 0 to 2 percent slopes. (Management group 1B.)

Manlove silt loam, 2 to 6 percent slopes, moderately eroded (MbB2).—The profile of this soil is similar to that of Manlove silt loam, 0 to 2 percent slopes, but the surface layer is thinner and there is a greater amount of runoff. The soil also absorbs water less readily and has a lower capacity for storing available moisture.

The soil occupies small areas within areas of other Manlove soils. As the result of erosion, it contains rills, shallow gullies, and galled spots. In areas where the yellowish-brown subsoil has been exposed by erosion, the texture is more clayey than that of the original surface soil, the supply of organic matter and plant nutrients is lower, and the soil makes a poor seedbed.

Erosion is the main limitation in using this soil. The principal crops are wheat and corn. Yields are lower than on the surrounding areas of Manlove soils.

The cropping system needs to be chosen carefully. Terraces and grassed waterways should be provided where needed and the soil tilled on the contour, stripcropped, and other suitable practices used to protect it from erosion. Add fertilizer and lime according to the needs indicated by soil tests. (Management group 1C.)

Martinsville Series

The Martinsville soils are well drained and are nearly level to strongly sloping. They have formed from glacial outwash of Wisconsin age. These soils occur on terraces and plains in valleys that border the uplands. The finer textured soils are in the narrower valleys. The native vegetation was a deciduous forest made up mainly of oak, hickory, elm, ash, maple, and walnut.

These soils are in the same catena as the Whitaker soils, which are somewhat poorly drained. They occur near the Fox soils and are similar to those soils but have formed from stratified sand and silt rather than from gravel mixed with sand. The Martinsville soils belong to the Gray-Brown Podzolic great soil group.

Profile of Martinsville silt loam in a wooded area:

A_0 0 to ¼ inch or more of well-decomposed forest litter, chiefly leaf mold with a few twigs from deciduous trees; neutral.

A_1 0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable when moist, nonplastic when wet; high content of organic matter; many fibrous roots; slightly acid to neutral.

A_2 4 to 12 inches, pale-brown (10YR 6/3) to light yellowish-brown (10YR 6/4) silt loam; weak, thick, platy structure to medium, granular structure; friable when moist, nonplastic when wet; low content of organic matter; medium acid.

B_1 12 to 18 inches, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4), light silty clay loam; moderate, medium, subangular blocky structure; sticky when wet, and hard when dry; medium acid.

B_{21} 18 to 30 inches, yellowish-brown (10YR 5/6) to brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; strongly acid.

B_{22} 30 to 46 inches, brownish-yellow (10YR 6/8), light silty clay loam with a few yellowish-brown (10YR 5/6) mottles; medium, coarse, blocky structure; firm when moist, plastic when wet, and hard when dry; strongly acid.

B_3 46 to 60 inches, yellowish-brown (10YR 5/8), heavy sandy loam; weak, coarse, blocky structure; friable when moist, but sticky when wet; stratified; slightly acid.

C_1 60 inches +, brownish-yellow (10YR 6/8), stratified sand and silt; calcareous.

Most of the soils of this series have slopes of 6 percent or less, but, on the terrace faces, the soils have short slopes of 35 percent or more in many places. Internal drainage is medium on the heavier textured soils and rapid on the lighter textured ones. Most of the rainfall is absorbed and drains through the soil.

The soils vary in color, in thickness, and in the texture of the horizons. Depth to calcareous material also varies. In a few places the A horizon contains enough sand to have a loamy texture. In places the soils grade to Fox soils. Here, the subsoil is coarser than that of the normal soil and contains some gravel; the parent material contains more gravel and coarse sand. In a few areas the subsoil is a fine sandy loam at depths of 2 to 3 feet or more. In these areas the soil is somewhat droughty.

Martinsville silt loam, 0 to 2 percent slopes (McA).—This soil is light colored and is low in organic matter. The profile is similar to the one described for the series. Mapped with it are small areas of somewhat poorly drained Whitaker soils that occur around slight depressions.

More than three-fourths of this soil is used for crops, and the rest is in pasture or timber. The principal crop is corn.

The cropping system should be chosen carefully. The soil can be cropped intensively if adequate lime is added, the supply of plant nutrients is built up, and the available moisture-holding capacity is improved. If there is adequate moisture, corn can be grown for several years in succession. Sometimes the crop is damaged by lack of moisture, but good yields are generally obtained if the supply of organic matter is kept fairly high, large amounts of commercial fertilizer are applied, and moisture is adequate. The soil is well suited to alfalfa but needs lime and a commercial fertilizer, particularly potash. (Management group 1A.)

Martinsville silt loam, 2 to 6 percent slopes, slightly eroded (McB1).—This profile is similar to the one described for the series, but it is medium acid to strongly acid above the C horizon. Depth to the parent material is about 4 feet.

Most of this soil is cultivated, but a small part is in pasture or timber. Corn and wheat are the principal crops. The soil is well suited to alfalfa and red clover.

This soil is likely to erode if it is cropped intensively. Like Martinsville silt loam, 0 to 2 percent slopes, it needs to have the supply of organic matter built up and to have fertilizer added. Lime must be added for crops to grow well, particularly alfalfa. Grassing the waterways, tilling on the contour, and using a suitable cropping system will help to control erosion. (Management group 1B.)

Martinsville silt loam, 2 to 6 percent slopes, moderately eroded (McB2).—The profile of this soil has a thinner surface layer than the profile described for the series, but it is otherwise similar. The surface layer is 3 to 8 inches thick. In the more severely eroded areas, plowing has mixed part of the yellowish-brown subsoil with the surface soil. In these areas the present plow layer makes a poor seedbed because it is somewhat cloddy and is low in plant nutrients and organic matter.

Erosion is the main problem in managing this soil. As the soil becomes more eroded, it becomes harder to till and the supply of plant nutrients decreases. It can be used and managed about the same as Martinsville silt loam, 2 to 6 percent slopes, slightly eroded, but should be cropped less intensively and requires more fertilizer. In the more severely eroded areas, manure should be added and green-manure crops turned under. Generally, this soil occurs in small areas that are more practical to farm along with adjoining soils than separately. These small areas require suitable practices to control erosion. (Management group 1C.)

Martinsville silt loam, 6 to 12 percent slopes, moderately eroded (McC2).—The profile of this soil is similar to the one described for the series, but the layers are thinner and the depth to calcareous silt and sand is less. The surface layer is 3 to 8 inches thick. In some severely eroded areas, the present plow layer is made up mainly of yellowish-brown subsoil, which is cloddy and makes a poor seedbed.

Erosion is the main problem in managing this soil. The soil can be cropped less intensively than Martinsville silt loam, 0 to 2 percent slopes, and more intensive practices are needed to prevent erosion and to control runoff. It can be used for long-term meadow or pasture, but a row crop should be planted occasionally. The row crop will help in renovating pastures and in controlling weeds. (Management group 1F.)

Martinsville silt loam, 12 to 18 percent slopes, moderately eroded (McD2).—The profile of this soil has thinner layers than the profile described for the series, and the depth to calcareous silt and sand is less. The two profiles are otherwise similar. In some severely eroded areas, the present plow layer consists mainly of yellowish-brown silty clay loam from the subsoil. In some small areas the soil has short slopes of more than 18 percent. These short, steep slopes are generally not suitable for cropping.

Most of this soil has been cleared, but only a few small areas are used for crops. The present vegetation is mainly briers, shrubs, weeds, and some bluegrass.

The use of this soil is limited by the extent to which practices can be applied to prevent erosion. If the soil is cropped, trees should be planted on any steep, narrow strips within the field. The more severely eroded and steeper areas are best used for permanent pasture or trees. (Management group 1J.)

Miami Series

The Miami soils are well drained. They have formed from highly calcareous glacial till of Late Wisconsin age. The soils are on low knolls on the till plain and on sloping areas near drainageways. In these counties they are mainly in northwestern Fayette County, but some areas are in northeastern Union County. The native vegetation was a deciduous forest made up mainly of maple, ash, elm, and white and red oaks. Many of the steep areas are still in forest.

These soils are in the same catena as the moderately well drained Celina soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston and Kokomo soils. In contrast to the Miami soils, the Brookston soils are dark colored and the Kokomo are very dark colored. The Miami soils are similar to the Russell soils, but they are less weathered, their B horizon is not so acid, and the depth to calcareous till is less. The Miami soils are in the Gray-Brown Podzolic great soil group.

Profile of Miami silt loam (NE¼NE¼ sec. 15, T. 15 N., R. 11 E., Fayette County, Ind.):

A_p 0 to 7 inches, dark grayish-brown (10YR 4/2) to brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable when moist, but slightly sticky when wet; moderate content of organic matter; medium acid.

A_2 7 to 10 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine to medium, subangular blocky structure; friable when moist, but slightly plastic when wet; low content of organic matter; medium acid.

B_1 10 to 15 inches, brown (10YR 5/3), heavy silt loam to light silty clay loam; moderate, medium, subangular blocky structure; friable when moist, but somewhat plastic when wet; strongly acid.

B_2 15 to 22 inches, brown (10YR 5/3) silty clay loam; strong, medium, subangular blocky structure; firm when moist, and hard when dry; the upper part is strongly to medium acid, but the lower part is slightly acid and is somewhat darker colored.

C 22 inches +, yellowish-brown (10YR 5/6), gritty loam till; weak, coarse, blocky structure; calcareous.

The knolls on which many of these soils occur range from a few feet to 10 to 20 feet in height. In some places the soils are nearly level, but in others they have slopes of as much as 25 percent. In wooded areas the soils have a dark grayish-brown surface layer, 1 to 3 inches thick, that is neutral to slightly acid. The Miami soils in northwestern Fayette County are shallower and less acid than those in northeastern Union County. In Fayette County the depth to calcareous material ranges from 13 to 42 inches, but in most places the depth is less than 20 inches. In places the soils contain some sand and have a loamy texture.

Miami silt loam, 0 to 2 percent slopes (MmA).—The profile of this soil is similar to the profile described for the series. It varies mainly in the color and thickness of the layers and in depth to calcareous till.

In places this soil grades to Russell silt loam. Here, the silty material is deeper than that in the typical soil, the upper part of the profile contains less grit, and the soil is more acid than normal. In other places, where the soil grades to Crosby soils, the lower part of the subsoil is slightly mottled. A few areas of this soil occur in the valleys of streams. In these areas the soil is stratified in some places.

This soil has no serious limitations. The supply of moisture is adequate for most crops. Most of the soil is used to grow corn and meadow crops, and a small part is in bluegrass pasture of good quality. Yields are generally higher and easier to maintain than on the more strongly sloping or eroded soils of the series.

Generally, corn follows hay crops in the cropping system, but it is often grown for 2 or more years in succession. The soil is well suited to wheat and to clover, alfalfa, and other legumes. A cropping system is needed that will help to maintain and increase the content of organic matter and the supply of plant nutrients. Lime is necessary for legumes to grow well; it should be applied according to the needs indicated by soil tests. For good yields of all crops, large amounts of commercial fertilizer are required. (Management group 1A.)

Miami silt loam, 2 to 6 percent slopes, slightly eroded (MmB1).—Erosion has made the profile of this soil somewhat shallower than the one described for the series, but it is otherwise similar. In a few places plowing is entirely within the subsoil. Surface runoff is more rapid than on the typical soil, and water moves more slowly through the profile.

This soil can be used and managed about the same as Miami silt loam, 0 to 2 percent slopes. It is more erodible, however, and extra care is needed to maintain the content of organic matter and the supply of plant nutrients. Most of it is used for crops. The cropping system generally consists of corn, soybeans, wheat or oats, and hay. If feasible, tillage should be on the contour to help prevent further erosion. (Management group 1B.)

Miami silt loam, 2 to 6 percent slopes, moderately eroded (MmB2).—The profile of this soil is similar to that of the soil described for the series, but the surface layer is only 3 to 8 inches thick. In some of the more severely eroded areas, the present plow layer consists of silty clay loam from the subsoil that has been mixed with the remaining dark-colored surface soil by tillage.

This soil has been cultivated intensively. As a result, erosion has been continuous. Consequently, the supply of plant nutrients has decreased, the soil now absorbs less moisture than formerly, and tilth is poor. In many places corn has been cultivated up and down the slope and rill erosion has occurred.

Most of this soil is in small areas that are generally used the same as adjoining soils. The soil requires care to prevent further erosion. Using a cropping system that has fewer row crops and more meadow crops will help to prevent further erosion. (Management group 1C.)

Miami silt loam, 6 to 12 percent slopes, slightly eroded (MmC1).—The surface layer of this soil is thinner than that in the profile described for the series, but the two profiles are otherwise similar. This soil is on uplands near other Miami silt loams. Surface runoff is medium to rapid, and internal drainage is medium.

About half of this soil is in forest. Most of the rest is in permanent pasture that is partly wooded, but a small part is in crops. The principal crops are small grains and hay. The risk of erosion is the principal management problem. (Management group 1E.)

Miami silt loam, 6 to 12 percent slopes, moderately eroded (MmC2).—The profile of this soil has somewhat thinner layers than the profile described for the series, and it is shallower over calcareous till. Otherwise, the two profiles are similar. In the more severely eroded areas, the present plow layer is a mixture of lighter colored subsoil and the remaining dark-colored surface soil.

This soil is likely to erode if it is cultivated. To maintain satisfactory yields, practices are needed to control erosion. Most of the soil is best suited to small grains and hay crops. (Management group 1F.)

Miami silt loam, 12 to 18 percent slopes, slightly eroded (MmD1).—The profile of this soil is similar to that described for the series, but it is thinner and more variable in color and in depth to calcareous till. In places this soil occurs near Russell and Miami silt loams. In these areas much of the mantle of silt has been removed; the soil is somewhat deeper and more acid than in the northwestern part of Fayette County.

The risk of erosion is the main problem in managing this soil. Because of the very rapid runoff and inadequate cover of plants, less moisture is stored in this soil than in the less sloping Miami soils. Much of the soil is in forest. In most places the crops are similar to those grown on nearby soils. Yields are somewhat lower than on Miami silt loam, 0 to 2 percent slopes. (Management group 1H.)

Miami silt loam, 12 to 18 percent slopes, moderately eroded (MmD2).—This soil has somewhat thinner layers and is somewhat shallower over calcareous till but its profile is otherwise similar to that described for the series. From ¼ to ¾ of the original surface layer has been removed through erosion. The present surface layer is 3 to 8 inches thick and consists of grayish-brown to brownish-yellow, heavy silt loam to light silty clay loam. In places the heavier textured subsoil is exposed. Most of this soil occurs near the Russell and Miami silt loams. It is more acid than the Miami silt loams in the northwestern part of Fayette County.

This soil is best suited to small grains, alfalfa or other meadow crops, or to permanent pasture. Because of erosion, the supply of plant nutrients is lower than in Miami silt loam, 0 to 2 percent slopes. Consequently, yields are lower. (Management group 1J.)

Miami silt loam, 18 to 25 percent slopes, slightly eroded (MmE1).—This soil has a profile similar to the one described for the series, but it has much thinner layers and the depth to calcareous till is only 15 to 25 inches. Surface runoff is very rapid; much of the rainfall runs off before it can soak into the soil.

Most of this soil is still under forest. If cultivated, it is likely to erode. The soil is better suited to permanent pasture and forest than to tilled crops. (Management group 1K.)

Miami silt loam, 18 to 25 percent slopes, moderately eroded (MmE2).—This soil has a profile similar to that of Miami silt loam, 18 to 25 percent slopes, slightly eroded. Most of it has been cultivated. As a result, much of the original surface soil has been lost through erosion. The management is similar to that used for Miami silt loam, 18 to 25 percent slopes, slightly eroded. (Management group 1K.)

Miami soils, 2 to 6 percent slopes, severely eroded (MsB3).—The profile of soils in this mapping unit is similar to that described for the series, except that little of the silt loam, originally in the upper layers, remains. In more than three-fifths of the acreage, the present plow layer is made up mainly of the heavier textured subsoil. In most areas the yellowish-brown to brownish-yellow subsoil is exposed. As a result, the areas appear somewhat spotted, particularly in wet weather. In areas where the subsoil is exposed, the soils are low in organic matter and plant nutrients and make a poor seedbed.

The use of these soils is limited by the undesirable characteristics of the present surface layer, which consists of former subsoil in many places. The soils occur near other Miami soils. In most places similar crops are grown. Yields vary somewhat but generally are lower than those on the less eroded soils of the series. (Management group 1D.)

Miami soils, 6 to 12 percent slopes, severely eroded (MsC3).—The profiles of these soils are similar to the one described for the series, but the soils have lost from three-fourths to all of the original surface soil through erosion. In much of the acreage, the heavier textured subsoil is exposed. Erosion has removed part of the subsoil in places, but the present plow layer is made up mainly of the upper part of the subsoil. In some small areas the soils are severely gullied; in places the limy glacial till is exposed. Tilth is generally poor in these soils.

Except for the gullied areas, most of the soils are in permanent pastures, which are fair to poor. A small part is in corn, wheat or oats, and hay crops, but yields are low.

These soils erode easily. They have a low capacity to hold available moisture. The soils are not suitable for tilled crops, but they can be used for small grains, meadow, or permanent pasture. (Management group 1G.)

Miami soils, 12 to 18 percent slopes, severely eroded (MsD3).—These soils have a profile similar to the one described for the series, but they have lost much of the original surface soil and part of the subsoil through erosion. As a result, the depth to calcareous till is somewhat less than in the typical profile. The present plow layer consists mainly of yellowish-brown silty clay loam from the subsoil. In many places, however, this layer is silt loam. In some more severely eroded areas, gullies occur, and in places the limy glacial till is exposed.

These soils have very rapid runoff, and they erode easily. They are probably better suited to permanent pasture or forest than to crops that require tillage. An occasional cultivated crop can be grown when meadows need to be reseeded. The meadows should be seeded in contour strips and maintained for at least 3 years. (Management group 1J.)

Miami soils, 18 to 25 percent slopes, severely eroded (MsE3).—These soils are steep and are severely eroded. In some places gullies occur.

The soils are best kept in permanent pasture or in trees. If the pastures are well managed, yields are medium. Areas that are gullied need to be leveled before they can be seeded and used for pasture. (Management group 1L.)

Milton Series

The Milton soils are well drained. They are nearly level to gently sloping. The soils occur on terraces that are above the short, steep breaks of streams. They have formed in shallow deposits of glacial drift of Wisconsin age. The drift overlies limestone bedrock. The native vegetation consisted mainly of forests made up of sugar maple, oak, hickory, black walnut, and other deciduous trees.

The Milton soils resemble the Wynn soils in color, but they differ in having some grit in the surface soil and subsoil. Furthermore, they are shallower over bedrock. In some places the soils are similar to the Fox soils, but the Milton soils have less gravel in the profile and contain fragments of limestone rather than limy gravel.

Runoff ranges from slow to rapid, depending on the slope. Generally, internal drainage is medium, but it is somewhat rapid in areas that are underlain by porous limestone. The Milton soils are in the Gray-Brown Podzolic great soil group.

Profile of Milton silt loam:

A_p 0 to 9 inches, brown (10YR 5/3), heavy silt loam; moderate, fine to medium, granular structure; contains some grit; slightly acid.

B_1 9 to 15 inches, yellowish-brown (10YR 5/4), heavy silty clay loam; fine, subangular blocky structure with brown (10YR 5/3) coating on faces of peds; friable to slightly firm when moist, sticky when wet, and hard when dry; slightly acid to neutral.

B_{21} 15 to 24 inches, yellowish-brown (10YR 5/6) silty clay; moderate, medium to coarse, subangular blocky structure with brown (7.5YR 5/4) coating on faces of peds; sticky when wet, and hard when dry; slightly acid to neutral.

B_{22} 24 to 30 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium to coarse, subangular blocky structure; firm when moist, sticky when wet, and hard when dry; contains small stones; neutral.

C_1 30 to 36 inches, light yellowish-brown (2.5Y 6/4) clay; contains fragments of crystalline limestone.

D 36 inches +, bluish-gray, flaggy or thin-bedded limestone and calcareous shale of the Ordovician period.

The B horizons in these soils vary in texture and in thickness, and the B_{22} horizon varies in color. Because of the influence of limestone of Ordovician age, the content of clay is higher than in the modal profile. The depth to limestone ranges from 18 to 42 inches. In the shallower soils the surface soil and subsoil are generally less acid than in the deeper soils. In some places these soils are stony.

Milton silt loam, 2 to 6 percent slopes, slightly eroded (MtB1).—This soil occurs in a few small areas, mainly near Contreras in Union County. The profile is similar to the profile described for the series; it differs in that the color of the surface layer ranges from light brown to dark brown. In the darker colored areas, the content of nitrogen and organic matter is slightly higher than in the typical soil. The soil erodes easily, but most of the eroded areas are on the terrace escarpments. A few areas are not eroded.

Most of this soil is used for crops. A small acreage is in pasture of low quality or is idle. The principal crops are corn, wheat, and clover or mixed hay crops. Corn is grown occasionally for 2 or more years in succession. It makes medium to high yields on areas that are not eroded or that are but little eroded. The soil is well suited to Kentucky bluegrass. Erosion can be controlled by using the soil for bluegrass pasture. (Management group 1B.)

Milton silt loam, 2 to 6 percent slopes, moderately eroded (MtB2).—This soil occurs in small areas on low terraces. It is in Union County. Some small, narrow areas on the terrace escarpments have short slopes that are steeper than 6 percent. Runoff is dominantly medium, but on the steeper slopes it is rapid.

This soil erodes easily. It is used and managed about the same as Milton silt loam, 2 to 6 percent slopes, slightly eroded. Yields of most crops are slightly lower, however, because some plant nutrients have been lost through erosion. The soil is well suited to Kentucky bluegrass. The bluegrass provides good pasture and helps to prevent erosion. The soil can be tilled on the contour without difficulty. (Management group 1C.)

Nineveh Series

The Nineveh soils are well drained to excessively drained. They are on low terraces and plains between the flood plain and the higher terraces occupied by the Fox soils. The soils have formed from glacial drift of both Early and Late Wisconsin age. The native vegetation was predominantly prairie grasses, but there was a scattering of oak, hickory, hackberry, ash, and other trees.

In Fayette and Union Counties, these soils occur near the Fox soils. The surface layers and subsoils are darker colored than those of the Fox soils, and the Nineveh soils contain more organic matter and are less acid. The Nineveh soils also have a thinner solum; depth to limy gravel is only about 30 inches. Internal drainage is medium to rapid. The Nineveh soils belong to the Brown Forest great soil group. Only one soil of this series, Nineveh loam, occurs in Fayette and Union Counties.

Profile of Nineveh loam:

A_{11} 0 to 4 inches, dark yellowish-brown (10YR 3/4) loam; weak, fine, granular structure; friable; high content of organic matter; neutral.

A_{12} 4 to 10 inches, very dark grayish-brown (10YR 3/2) loam; fine, granular structure; friable; high content of organic matter; neutral.

B_1 10 to 14 inches, brown (10YR 4/3), light clay loam to heavy loam; weak, fine, subangular blocky structure; firm when moist; neutral.

B_2 14 to 18 inches, brown (7.5YR 5/4) sandy clay loam; contains some gravel; moderate, medium, subangular blocky structure; plastic and sticky when wet, but hard when dry; neutral.

B_3 18 to 24 inches, reddish-brown (5YR 4/3), gravelly clay loam; moderate, coarse, subangular blocky structure; plastic and sticky when wet, but hard when dry; neutral.

C 24 inches +, pale-brown (10YR 6/3) gravel and sand; stratified; calcareous.

The number of rock fragments throughout the profile and the depth to calcareous gravel and sand vary in these soils. The subsoil varies in thickness and in the amount of clay it contains. In many places the Nineveh soil in the valley of the west fork of the Whitewater River has a deeper and darker surface soil and a weaker textural

B horizon than the soil described for the series. In addition, it is calcareous at shallower depths resembling Rodman gravelly loam.

Nineveh loam (Nn).—Most of this soil is in Fayette County. It is mainly along the west fork of the Whitewater River, but a few small areas occur in other places. The profile is the same as the profile described for the series.

In some places this soil is shallow and droughty; in others, it is moderately deep and has an adequate supply of moisture. The soil in some areas is calcareous, and in these areas it may be deficient in potassium.

The soil is high in lime. It is well suited to alfalfa, and should be used for that crop as much of the time as feasible. For alfalfa to grow well, however, adequate amounts of commercial fertilizer should be added, particularly potash. The soil is better suited to fall-seeded small grains than to oats, corn, or soybeans. Unless rainfall is well distributed throughout the growing season, corn is generally damaged by lack of moisture. The soil is often left idle after the corn has been harvested. (Management group 4A.)

Ockley Series

The Ockley soils are well drained. They occur on broad outwash plains and high terraces, many of which are slightly lower than the adjacent glacial till plain. The soils have formed in a mantle of silty and loamy materials that are about 3 feet thick and that overlie sand and gravel of Wisconsin age. The loamy material grades through a transitional layer to calcareous gravel and sand, which is at depths of 3½ feet or more. Most of the soils have been cleared, but the original cover was a heavy stand of oak, sugar maple, walnut, and beech.

These soils are in the same catena as the Westland soils, which are dark colored and very poorly drained. In contrast to the Fox soils, the solum of the Ockley soils is 3½ feet or more thick. Furthermore, the A horizons and the upper part of the B horizons are more acid and generally are more silty. Water penetrates the surface soil and moves through the subsoil readily. Internal drainage is medium to rapid, depending upon the depth of the soil and the amount of gravel it contains. The soils are in the Gray-Brown Podzolic great soil group.

Profile of Ockley silt loam (NE¼SW¼ sec. 14, T. 13 N., R. 12 E., Fayette County, Ind.):

A_p 0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate to weak, fine, granular structure; friable when moist, slightly sticky when wet, and hard when dry; medium acid.

A_2 7 to 13 inches, brown (10YR 5/3) silt loam; moderate to weak, fine, granular structure; friable when moist, slightly sticky when wet, and hard when dry; low content of organic matter; medium acid.

B_1 13 to 20 inches, yellowish-brown (10YR 5/4), light silty clay loam; fine, medium, subangular blocky structure; plastic when wet, and hard when dry; strongly acid.

B_{21} 20 to 40 inches, brown (7.5YR 5/4) silty clay loam; medium, subangular to angular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid to strongly acid.

B_{22} 40 to 48 inches, reddish-brown (5YR 5/3) sandy clay loam; moderate to weak, coarse, blocky structure; plastic when wet, and hard when dry; content of gravel and sand varies; medium acid to strongly acid.

B_3 48 to 54 inches, brown (7.5YR 4/4), light clay loam or loam; weak, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid to slightly acid.

D 54 inches +, yellowish-brown (10YR 5/4), loose, stratified gravel and sand; calcareous.

The mantle of silty parent materials ranges from 18 to about 36 inches in thickness. In a few places the B_{21} and B_{22} horizons contain more gravel and sand than the normal soil.

Ockley silt loam, 0 to 2 percent slopes (OcA).—This is the most extensive of the Ockley soils mapped in Fayette and Union Counties. The areas are large and are uniformly level. The profile is similar to the profile described for the series.

In some places in this soil, glacial till underlies the sand at depths of 7 to 10 feet. Here, there is a better supply of moisture than in areas where the gravel is deeper or the texture of the soil is coarser. In areas where the soil occurs near the Fox soils, it is shallower than normal and is similar to the Fox soils.

Most of this soil is used for crops. Corn is the principal crop, but the soil is well suited to most of the other crops commonly grown. Corn usually produces medium yields but makes higher yields when the supply of moisture is plentiful throughout the growing season. In areas where the soil is finer textured than the normal soil, wheat grows well and there is only a slight risk of damage from winterkilling. Alfalfa yields well on this soil. It is better able to use the supply of available moisture than plants that have shallower root systems. The hay is of high quality. (Management group 4A.)

Ockley silt loam, 2 to 6 percent slopes, slightly eroded (OcB1).—This soil occurs around drainageways and shallow kettle holes on outwash plains and terraces. It has lost part of the original surface soil through erosion, but the profile is otherwise similar to the one described for the series. In most places the present surface soil is 7 to 8 inches thick. In some places, however, the surface soil is shallower, and in a few places the subsoil is exposed.

The supply of available moisture is limited in this soil. Runoff is medium. If farmed intensively, the soil is likely to erode.

This soil can be used and managed about the same as Ockley silt loam, 0 to 2 percent slopes. More care is required, however, to prevent erosion. Most of the soil is on short slopes along streams; in these places contour tillage will help to control erosion. The areas around kettle holes are difficult to till on the contour. Therefore, longer cropping systems are needed, or the soils should be kept in permanent pasture. (Management group 4B.)

Ockley silt loam, 2 to 6 percent slopes, moderately eroded (OcB2).—This soil has a profile similar to the one described for the series. It has a thinner surface layer; however, in most places, the present surface layer is 3 to 8 inches thick. In some places the reddish-brown, heavy-textured subsoil is exposed.

This soil has been used intensively for clean-tilled crops. As a result it is now moderately eroded, and further erosion is likely. The supply of available moisture is not so high as in the less eroded soils of the series.

This soil is better suited to soybeans, wheat, rye, and grass-legume mixtures, which do not require large amounts of moisture, than to corn, oats, and red clover. The stands on permanent bluegrass pastures are generally thin and weedy, and the carrying capacity is low. If this soil is used for row crops, it should be terraced or stripcropped. (Management group 4C.)

Ockley soils, 2 to 6 percent slopes, severely eroded (OkB3).—These soils generally occur in small areas on the breaks of ridges. Their surface layer is thinner than in the profile described for the series, but the profiles are otherwise similar. In many of the areas, the present surface layer is less than 3 inches thick. In many places all of the original surface layer has been lost through erosion and the subsoil is exposed. In some places part of the subsoil has been lost. In areas where the subsoil is exposed, the present plow layer has a high content of clay and is low in plant nutrients and organic matter. In a few places there are shallow gullies. The soils have a medium to low available moisture-holding capacity.

These soils should be terraced or stripcropped if they are used for row crops. Generally, they are cultivated intensively, and the risk of erosion is moderate to severe. In many of the areas, no practices are used to protect the soils. As erosion progresses, the supply of available moisture becomes more limited and yields become lower. (Management group 4C.)

Ockley silt loam, 6 to 12 percent slopes, moderately eroded (OcC2).—The profile of this soil is somewhat shallower than the one described for the series, but it is otherwise similar. The soil occurs on terrace breaks or on escarpments along streams.

The soil has steep slopes. Runoff is rapid, and there is a serious risk of erosion. As erosion progresses, the supply of available moisture becomes more limited.

This soil should have a permanent cover most of the time. If used for crops, it is probably best suited to wheat or mixed hay. Contour tillage, terracing, and other suitable practices are needed to prevent further erosion. Inasmuch as the slopes run in one direction, these practices can be applied easily. (Management group 4D.)

Ockley soils, 6 to 12 percent slopes, severely eroded (OkC3).—These soils have a profile similar to the one described for the series, but they are severely eroded. The surface layer consists of grayish-brown, heavy loam to yellowish-brown clay loam. In most places the subsoil is exposed, and there are a few small gullies.

A permanent cover should be kept on this soil most of the time. If practices are used to protect against erosion, the soil can be used to a limited extent for small grains and for long-term meadows consisting of grasses and legumes. (Management group 4E.)

Reesville Series

The Reesville series consists of nearly level to gently sloping soils that are light colored and somewhat poorly drained. They occur on the Wisconsin till plain. The areas are widely distributed throughout Fayette and Union Counties, but the largest areas are in northwestern Fayette County. The soils have formed in loess that is 3 to 5 feet or more deep and overlies limy glacial till of Wisconsin age. The native vegetation was a hardwood forest made up mainly of oak, beech, maple, and hickory.

These soils are in the same catena as the well drained Manlove and the moderately well drained Birkbeck soils. They are similar to the Fincastle soils but differ in having formed entirely in silt. They belong to the Gray-Brown Podzolic great soil group.

Profile of Reesville silt loam, 0 to 2 percent slopes (NW¼NW¼ sec. 1, T. 14 N., R. 13 E., Fayette County, Ind.):

A_p 0 to 6 inches, brown (10YR 5/3) to grayish-brown (10YR 5/2), smooth silt loam; moderate, fine, crumb structure; friable when moist, slightly sticky when wet, and soft when dry; slightly acid.

A_2 6 to 12 inches, grayish-brown (10YR 5/2) silt loam with a few mottles of pale yellow and yellowish brown; moderate, medium, platy structure; friable when moist, slightly sticky when wet, and soft when dry; slightly acid to medium acid.

B_1 12 to 15 inches, light yellowish-brown (10YR 6/4), light silty clay loam with yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; strongly acid.

B_2 15 to 27 inches, yellowish-brown (10YR 5/6), heavy silty clay loam; weak, medium to coarse, prismatic structure but breaks to moderate, medium, angular blocks; faces of peds are dark yellowish brown (10YR 4/4); plastic when wet, and very hard when dry; strongly acid.

B_3 27 to 40 inches, brownish-yellow (10YR 6/6), heavy silt loam mottled with dark grayish brown (10YR 4/2); weak, coarse, blocky structure; firm when moist, plastic when wet, and hard when dry; slightly acid to neutral.

C_1 40 to 52 inches, brownish-yellow (10YR 6/6) silt loam; structureless, but contains many capillary tubes that have films of dark-brown, iron-manganese oxide; friable when moist, somewhat plastic when wet, and soft when dry; calcareous.

C_2 52 to 58 inches, light yellowish-brown (10YR 6/4), gritty silt mottled with yellowish brown (10YR 5/8); structureless; calcareous; this layer is transitional to the calcareous till below.

D_1 58 inches +, pale-brown (10YR 6/3), calcareous loam till mottled with yellowish brown (10 YR 5/6); contains some large pebbles and fragments of limestone.

The chief differences among these soils are caused by the thickness of the loess. The loess is generally thinnest on the gently sloping areas and thickest on the level to slightly depressed areas. In areas where the loess is more than 3 feet thick, the soils are generally limy, but in some of the shallower areas they are also limy. In places the soils grade to the Fincastle soils. Here, the loess is thinner and is leached of carbonates in many places. In other places the soil is similar to the Delmar soil but has a thicker layer of loess. In these places the soil is lighter colored than in the profile described, and is more poorly drained.

Reesville silt loam, 0 to 2 percent slopes (ReA).—The profile of this soil is the same as the profile described for the series. The soil occurs both in Fayette and in Union Counties.

This soil is somewhat wet, but most of it is cropped intensively. It is a productive soil and is used for all of the crops commonly grown in the area. Corn is the principal crop. In many places is grown for 2 years in succession. Legumes are generally included in the cropping system and make moderately high to high yields. Fertilizer is required to increase yields, and lime is needed to correct acidity. (Management group 5A.)

Reesville silt loam, 0 to 2 percent slopes, moderately eroded (ReA2).—This soil has a thinner surface layer than that in the profile described for the series, but it is otherwise similar. It has long, very gentle slopes. Runoff from these slopes is likely to cause erosion. Internal drainage is slow.

In most places erosion can be prevented by tilling on the contour. Corn is the main crop grown on this productive soil. Fertilizer is required, and lime is needed to correct acidity. (Management group 5A.)

Reesville silt loam, 2 to 6 percent slopes, moderately eroded (ReB2).—The profile of this gently sloping soil is similar to the one described for the series, but the surface layer is thinner because of erosion. The present surface layer is only 3 to 8 inches thick. In places much of the original surface soil has been lost through erosion. Here, the present plow layer is a mixture of the heavier textured, yellowish-brown subsoil and the remaining surface soil. Internal drainage is slow.

Nearly all of this soil has been cultivated. Yields are lower than on the uneroded soil. Building up the content of organic matter and adding lime, fertilizer, and manure will help to improve the yields. Contour tillage and terracing will help to prevent erosion. The waterways should be grassed to prevent gullies from forming. (Management group 5B.)

Riverwash

Riverwash (Rw).—This miscellaneous land type occurs as islands along the edges of streams. It consists of gravel, sand, and rocks mixed with a small amount of finer textured material. The areas are only a little above water when the streams are at normal level. A single flood may change the size and shape of an area considerably.

Most areas of Riverwash support a scanty growth of weeds, shrubs, and willows. They are not suitable for crops but are useful habitats for wildlife. Riverwash has not been placed in a management group.

Rodman Series

The Rodman soils are strongly sloping to very steep and are excessively drained. They are on breaks or on the escarpments of terraces. Most of the soils are in areas that lie between the Ockley soils, on the higher terraces, and the Fox soils, on the lower terraces. Some are on conical hills and winding ridges near the kame phases of the Fox soils. The soils have formed from stratified, loose, gravelly, calcareous glacial drift that contains much limestone. The native vegetation was a hardwood forest made up mainly of oak and hickory.

These soils are shallow and droughty. Runoff is rapid, and the risk of erosion is moderate. It is likely that gullies will form in a few places and that sheet erosion will occur if the areas are not protected by a cover of plants. The soils are in the Brown Forest great soil group but have some characteristics of Regosols.

Profile of Rodman gravelly loam (SW¼SE¼ sec. 22, T. 13 N., R. 12 E., Fayette County, Ind.):

A_0 ¼ to 0 inch, very dark gray organic material, well decomposed; mainly leaf mold; neutral.

A_1 0 to 7 inches, very dark grayish-brown (10YR 3/2, dry) gravelly loam; moderate, fine, granular structure in upper part; friable; high content of organic matter; neutral to slightly calcareous.

A_2 7 to 12 inches, brown to dark-brown (7.5YR 4/2 to 3/2) gravelly loam that becomes paler or more yellowish with increasing depth; weak to medium, subangular blocky structure; slightly sticky when wet, and soft when dry; very slightly acid.

C_1 12 inches +, brown (7.5YR 5/4) to pale brown (10YR 6/3) loose, highly calcareous gravel and sand; contains much limestone.

These soils vary chiefly in color and thickness and in the content of organic matter and degree of development of the horizons. The soils on the steeper slopes are essentially skeletal and have much unweathered, limy parent material on the surface. Mapped with this soil is some Fox loam on gentler slopes. This included soil varies in thickness but generally is less than 36 inches deep.

Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded (RgD2).—The profile of this soil is similar to the one described for the series, but the surface layer is generally thicker. In some included uneroded areas, the surface layer is as thick as 18 inches and has a texture of silt loam or loam. In eroded areas the surface layer is shallow and dark colored and is 3 to 8 inches or more thick.

This soil is droughty and erodible. The smaller areas are generally used the same as surrounding soils, or they are not cropped. Larger areas are best used for alfalfa, for long-term meadow crops, or for permanent pasture. Occasionally, a crop of wheat or a nurse crop can be grown when the meadow is reseeded. The seeding mixture for pastures should include trefoil or other legumes. (Management group 4F.)

Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded (RgE1).—This soil has a somewhat thinner surface layer and is shallower over calcareous gravel and sand than the soil described for the series, but the profiles are otherwise similar. It occurs between the Fox and Ockley soils, mostly in the valleys of the Whitewater River and its tributaries.

The soil is droughty and has moderately steep slopes. It is better used for pasture or forest than for tilled crops. (Management group 4G.)

Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded (RgE2).—This soil has a thinner surface layer than that in the profile described for the series, and the depth to calcareous material is less. The two profiles are otherwise similar. Most of this soil is in long, narrow areas near the Fox and Ockley soils.

The surface layer varies in color and in content of organic matter. Its texture ranges from loam to gravelly loam. In many cultivated areas, all of the surface soil has been lost through erosion and the subsoil of reddish-brown gravelly loam is exposed. The soil generally contains some gravel. Surface runoff is rapid, and most of the moisture runs off. Therefore, the supply of available moisture is reduced and the soil is droughty.

This soil is better suited to alfalfa or permanent pasture than to tilled crops. Forest is also a good use. (Management group 4G.)

Rodman gravelly loam, 25 to 50 percent slopes, eroded (RgF2).—This soil occupies steep to very steep areas on breaks or on escarpments along the Whitewater

River. Erosion ranges from none to moderate but is predominantly slight. Some areas that have a texture of loam or silt loam were mapped with this soil because they were too small to map separately.

This soil should be kept in forest. If it has already been cleared, it should be reforested to prevent further erosion. (Management group 4H.)

Ross Series

The soils of the Ross series are nearly level and are dark colored. They are well drained. The soils occupy small areas on flood plains. They have formed in alluvium. The alluvium washed from light-colored soils formed under forest on glacial drift of Wisconsin age. The dark color of the surface layer and of the upper part of the subsoil of the Ross soils was caused, in part, by the high content of lime in the deposits washed onto these soils. These soils are mainly on high bottoms. They are flooded infrequently, and little sediment is now being deposited. The native vegetation was a deciduous forest made up mainly of sycamore, elm, and ash.

The drainage of the Ross soils is similar to that of the Genesee soils. The Ross soils differ from the Genesee in having a darker color in the surface soil and in the upper part of the subsoil. They are in the Alluvial great soil group. Only one soil of this series, Ross silt loam, is mapped in Fayette and Union Counties.

Profile of Ross silt loam (Fayette County, Ind.):

A_p 0 to 7 inches, very dark brown (10YR 2/2) silt loam; moderately high content of organic matter; moderate, fine, granular structure; friable when moist, slightly sticky when wet, and soft when dry; neutral to mildly alkaline.

A_1 7 to 20 inches, very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) silt loam to heavy silt loam; moderate, medium, granular structure to weak, subangular blocky structure; friable when moist, slightly sticky when wet, and soft when dry; neutral.

C_1 20 to 34 inches, dark grayish-brown (10YR 4/2) to brown (10YR 5/3), heavy silt loam; weak, medium, subangular blocky structure; firm when moist, sticky when wet, and slightly hard when dry; neutral.

C_2 34 inches +, brown (10YR 5/3) to yellowish-brown (10YR 5/4), heavy silt loam; medium, granular to subangular blocky structure; friable when moist, and sticky when wet; neutral to calcareous.

The surface soil varies in thickness. The other layers vary in texture as well as in thickness. The soils are generally neutral, but in places they are slightly calcareous at depths of 4 feet or more.

Ross silt loam (Ro).—This soil occurs on the flood plains of the Whitewater River and its tributaries. The profile is similar to the profile described for the series.

About 90 percent of this soil is cultivated; the risk of the crop being lost because of flooding is slight. Corn is the main crop, but some alfalfa is grown, mainly in meadows. Yields are generally lower than those on the nearby Genesee soils. The supply of plant nutrients has been depleted because the soil has been used intensively for tilled crops and not enough fresh sediments have been deposited to renew the supply. Consequently, corn requires nitrogen fertilizer for best yields. (Management group 7A.)

Russell Series

The Russell soils are light colored and are well drained. In some areas they are nearly level, but in others the slopes are as much as 25 percent. The soils have formed in a layer of silt, 18 to 40 inches thick, that overlies glacial till consisting of loam to coarse clay loam. The till is limy at depths between 42 and about 70 inches. Originally, the soils were covered by a deciduous forest made up mainly of hard maple and oak. Now, most of the areas have been cleared and are used to grow crops or to pasture hogs and other livestock. Figure 6 shows a typical landscape of Russell soils.

These soils are in the same catena as the moderately well drained Xenia soils, the somewhat poorly drained Fincastle soils, the poorly drained Delmar and Cope soils, and the very poorly drained Brookston and Kokomo soils. Like the Russell soils, the Delmar are light colored, but the Cope and Kokomo soils are dark colored. The Russell soils are similar to the Miami soils, but their surface soils and subsoils are smoother and more acid and depth to calcareous till is greater.

The Russell soils are widely distributed throughout Fayette and Union Counties. The less sloping soils have medium runoff, but on the steeper soils, runoff is rapid. Internal drainage is medium. These soils are in the Gray-Brown Podzolic great soil group.

Profile of Russell silt loam in a wooded area (NW¼ sec. 6, T. 13 N., R. 13 E., Fayette County, Ind.):

A_0 ¼ to 0 inch, dark-brown (10YR 4/3) or dark grayish-brown (10YR 4/2) forest litter; slightly acid to neutral.

A_1 0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable when moist, slightly plastic when wet, and soft when dry; fairly high content of organic matter; slightly acid.

A_{21} 2 to 6 inches, grayish-brown (10YR 5/2), smooth silt loam; moderate, fine, granular structure; friable when moist, somewhat sticky when wet, and soft when dry; medium acid.

A_{22} 6 to 11 inches, brown (10YR 5/3) silt loam; weak, fine to medium, subangular blocky or thick platy structure; firm when moist, slightly plastic when wet, and slightly hard when dry; medium acid to strongly acid.

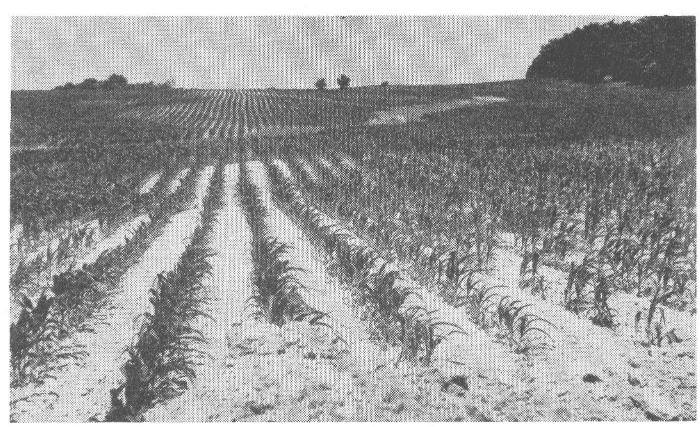

Figure 6.—**Typical landscape of Russell soils showing long, gentle slopes. The lighter colored spots on the upper parts of the slopes are areas where the soil is eroded. The light-colored, silty material from these areas has washed into the drainage channels.**

B_1 11 to 14 inches, yellowish-brown (10YR 5/6), light silty clay loam; moderate, medium, subangular blocky structure; firm when moist, somewhat plastic when wet, and hard when dry; medium acid to strongly acid.

B_{21} 14 to 34 inches, yellowish-brown (10YR 5/6), smooth silty clay loam; medium to coarse, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid to strongly acid.

B_{22} 34 to 45 inches, yellowish-brown (10YR 5/6), light silty clay loam; coarse, angular blocky structure; firm when moist, somewhat plastic when wet, and hard when dry; contains much grit; slightly acid in lower part of horizon.

C_1 45 inches +, yellowish-brown, gritty, highly calcareous, loamy glacial till composed of unassorted silt, clay, sand, and fragments of rock.

The horizons in these soils vary in thickness and in color and texture. Depth to calcareous material also varies. The silt is generally about 26 inches thick, but it is thicker in the nearly level areas and thinner on the steeper slopes. Depth to calcareous till ranges from 42 to about 70 inches, but it is generally about 46 inches. In places the calcareous till is loam to coarse clay loam.

In wooded areas there is a dark-colored surface layer, ¼ to 2 inches thick, that is rich in organic matter. In cultivated areas the plow layer is grayish brown to light yellowish brown to depths of 6 to 8 inches and has a fairly low content of organic matter. Some areas are so severely eroded that tillage is in the former subsoil and the present surface soil is yellowish-brown silty clay loam.

Russell silt loam, 0 to 2 percent slopes (RsA).—This soil occurs in both counties. Its profile is similar to the one described for the series, but its substratum has somewhat more rapid permeability. In some places, particularly near Philomath in Union County, there are stratified deposits of sandy loam in the substratum within the layer of till. These are generally at depths between 5 and 8 feet.

In a few small areas, the soil is moderately eroded and the combined A horizons are only about 8 inches thick. In places the soil grades to Xenia or Fincastle soils. Here, internal drainage is slower in places than in the typical soil and the subsoil has gray mottles at depths below 18 inches.

This soil has no serious limitations, but it needs fertilizer and lime. Much of it is cropped intensively. Corn is the principal crop. It is often grown for 2 or more years in succession if additional feed is needed for livestock. The yields are moderately high to high. (Management group 1A.)

Russell silt loam, 2 to 6 percent slopes, slightly eroded (RsB1).—This soil occurs throughout Fayette and Union Counties. The areas border streams or are on gently sloping knolls and ridges on the divides between streams. Water runs off this soil fairly rapidly and has caused slight erosion. The profile is similar to the profile described for the series. In some small areas the soil has slopes of more than 6 percent. In a few small areas, tillage has exposed the yellowish-brown subsoil.

This soil has a moderate risk of erosion, but it is productive. If it is used for row crops, tillage should be on the contour, waterways kept under sod, and other practices used to control erosion. Otherwise, the soil is used and managed about the same as Russell silt loam, 0 to 2 percent slopes. (Management group 1B.)

Russell silt loam, 2 to 6 percent slopes, moderately eroded (RsB2).—This is the most extensive soil in Fayette and Union Counties. It is steeper and more eroded than the soil described for the series. The surface layer is only 3 to 8 inches thick. In most places the present surface layer is silt loam. In the more severely eroded areas, however, the present surface layer is yellowish brown and contains more clay. In these severely eroded areas, the soil tends to form hard clods if tilled too wet.

Most of this soil has been used intensively to grow clean-tilled crops. As it became more eroded, the content of organic matter and the supply of plant nutrients were depleted. In addition, the capacity to absorb moisture was reduced and tilth became poor. Yields have declined since the soil was first cropped. They can be increased by building up the content of organic matter and by adding lime, fertilizer, and manure. Tilling on the contour and terracing will help to control erosion; grassing the waterways will help to prevent gullies from forming. (Management group 1C.)

Russell soils, 2 to 6 percent slopes, severely eroded (RtB3).—The soils in this mapping unit occupy many small areas in Fayette and Union Counties near other Russell soils. They have lost more than three-fourths of the original surface soil through erosion and, in some places, part of the subsoil. The present plow layer is light yellowish-brown, friable silt loam to brownish-yellow silty clay loam. The content of organic matter is low, and tilth is poor.

The soils have all been cleared. They are generally used for about the same crops as other Russell soils that have similar slopes. The yields vary, but generally they are somewhat lower than those obtained on the nearby, less eroded soils. The soils should be used less intensively than the less eroded soils. Extra care is needed to control erosion and to increase the supply of plant nutrients. (Management group 1D.)

Russell silt loam, 6 to 12 percent slopes, slightly eroded (RsC1).—This soil occurs in areas that are scattered throughout Fayette and Union Counties. Because of steeper slopes, the mantle of silt is thinner than in the profile described for the series and the depth to underlying limy till is somewhat shallower. The two profiles are otherwise similar. In most places about 7 inches of the material in the original surface soil remains, but in places plowing has mixed part of the subsoil with the surface soil.

This soil erodes easily if it is cultivated. Its use and management are similar to those of Russell silt loam, 2 to 6 percent slopes, slightly eroded, but contouring, stripcropping, terracing, and other practices to control erosion must be used more intensively. Normally, the supply of organic matter and plant nutrients is low in this soil. They must be replenished frequently to keep the soil productive. (Management group 1E.)

Russell silt loam, 6 to 12 percent slopes, moderately eroded (RsC2).—This soil has lost much of the original surface soil through erosion. In most places the present surface soil is silt loam and is 3 to 8 inches thick. In some of the more severely eroded areas, however, the plow layer consists of the remaining surface soil mixed with silty clay loam from the subsoil. In still other areas, the plow layer consists entirely of yellowish-brown silty clay loam from the subsoil.

The risk of erosion is serious on this soil. Cropping should be less intensive than on the less eroded soils. If the soil is used for tilled crops, tilling on the contour, terracing, and other practices are needed to control erosion. These practices should be applied more carefully than when used on less eroded soils. (Management group 1F.)

Russell soils, 6 to 12 percent slopes, severely eroded (RtC3).—These soils are severely eroded but are otherwise similar to the soil described for the series. In most of the areas, less than 4 inches of the original surface soil is left above the subsoil. In many places the plow layer consists of exposed subsoil; consequently, the present plow layer ranges in color and texture from light yellowish-brown silt loam to brownish-yellow silty clay loam. Some areas are severely gullied. The soils are low in organic matter and plant nutrients. They are somewhat acid and have poor tilth.

Erosion is the main problem in managing these soils. Generally, the soils are cropped intensively, but yields of most crops are low. The soils are better suited to meadow or to permanent pasture than to row crops. If they are used for row crops, practices are needed to control erosion and to increase the supply of plant nutrients. The larger and the more severely eroded areas are best used for meadow, permanent pasture, or timber. (Management group 1G.)

Russell silt loam, 12 to 18 percent slopes, slightly eroded (RsD1).—This soil has a profile with somewhat thinner layers than are in the profile described for the series, and it is shallower over calcareous till. The two soils are otherwise similar.

This soil erodes easily if it is not protected. Most of it has been kept in forest or permanent pasture, however, and little erosion has taken place. In areas that are cropped, the crops are similar to those grown on nearby Russell soils. Runoff is more rapid than on the less sloping soils. As a result, less moisture soaks into the soil and yields are somewhat lower. If the soil is used for row crops, it requires practices to control erosion. A cropping system consisting of small grains and meadow crops can be used to a limited extent, but practices will be required to prevent the soil from eroding. (Management group 1H.)

Russell silt loam, 12 to 18 percent slopes, moderately eroded (RsD2).—The profile of this soil is similar to the one described for the series. This soil is moderately eroded, however, and the surface layer is only 3 to 8 inches thick. In many places plowing has mixed part of the yellowish-brown subsoil with the remaining dark-colored surface soil. In small areas the subsoil is exposed.

This soil erodes easily and is difficult to till. It is best used for permanent pasture or timber. To get good stands of grass, apply lime and fertilizer according to the needs indicated by soil tests. A cropping system consisting of small grains and long-term meadow crops can be used if practices are applied to prevent further erosion. (Management group 1J.)

Russell soils, 12 to 18 percent slopes, severely eroded (RtD3).—These soils have lost much of the original surface soil and part of the subsoil through erosion. The present plow layer is made up mostly of yellowish-brown silty clay loam from the subsoil.

The soils are easily eroded. They should be kept in permanent pasture, or, if they have already been cleared, they should be replanted to trees. If practices are applied to prevent erosion, the soils can be used to a limited extent to grow small grains and meadow crops. Apply lime and fertilizer according to the needs indicated by soil tests to get satisfactory stands of grass established. (Management group 1J.)

Russell silt loam, 18 to 25 percent slopes, slightly eroded (RsE1).—The profile of this soil is similar to the one described for the series, but this soil has a somewhat thinner mantle of silt and thinner horizons. Also, depth to calcareous material is less. In some places this soil resembles Miami silt loam.

This soil has moderately steep slopes and is easily eroded. Most of it is in forest, however, and only slight erosion has taken place. The soil is best left in forest or used for permanent pasture. (Management group 1K.)

Russell silt loam, 18 to 25 percent slopes, moderately eroded (RsE2).—This soil has lost much of its original surface soil through erosion. The profile is otherwise similar to the one described for the series. The present surface soil is grayish-brown silt loam that is 3 to 8 inches thick. In places yellowish-brown clay from the subsoil is mixed with the remaining surface soil or is exposed. There are a few gullies in the more severely eroded areas.

This soil is best kept in forest. If necessary, it can be used for permanent pasture, but, generally, areas that have been cleared should be replanted to trees. (Management group 1K.)

Russell soils, 18 to 25 percent slopes, severely eroded (RtE3).—These soils have lost most of the silt loam surface soil and part of the subsoil through erosion. Many areas are gullied severely; some of the gullies are as much as 5 feet or more deep. In places the silty clay loam of the subsoil is exposed. In these places the soils are low in organic matter and plant nutrients, have poor tilth, and make a poor seedbed.

These soils are best used for forest. If necessary, the areas can be pastured if a program of pasture renovation is carried out. Legumes should be grown in the pasture, and the soils need adequate amounts of lime and commercial fertilizer. (Management group 1L.)

Russell and Miami silt loams, 0 to 2 percent slopes (RuA).—These soils have characteristics similar to those of the typical soils described for the Russell and Miami series. They vary, within short distances, in the thickness of the mantle of silt that overlies the till and in the depth to calcareous material. Generally, the silt is 15 to 30 inches thick and the depth to calcareous material is 30 to 34 inches. In places the variations are similar to those described for the typical soils of the two series. The soils are only slightly eroded and have 8 inches or more of the original surface soil remaining.

These soils are used for about the same crops as Russell silt loam, 0 to 2 percent slopes, and yields are similar. If lime and commercial fertilizer are added, the soils can be used intensively for crops other than corn. They can be used intensively for corn if, in addition, practices are used to prevent erosion. (Management group 1A.)

Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded (RuB1).—These soils are more sloping than Russell and Miami silt loams, 0 to 2 percent slopes, but they are otherwise similar. Most of the areas are used for crops. The soils are somewhat shallower than the Russell soils that have similar slopes, but they require similar management. They require lime and fertilizer and a suitable cropping system. If feasible, tillage should be on the contour and waterways should be kept under grass. (Management group 1B.)

Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded (RuB2).—These soils have lost from 1/4 to 3/4 of the original surface soil through erosion. The present plow layer is a mixture of the remaining dark-colored surface soil and the lighter colored subsoil. In some of the more severely eroded areas, tillage has exposed the subsoil.

Erosion is the main problem in managing these soils. Tilling on the contour, where feasible, and using a cropping system in which row crops are grown less of the time than meadow crops will help to reduce erosion. Apply commercial fertilizer and lime according to the needs indicated by soil tests. (Management group 1C.)

Russell and Miami soils, 2 to 6 percent slopes, severely eroded (RvB3).—These soils have lost much of the original surface soil through erosion. The present surface soil is made up mainly of subsoil, and in most places the subsoil is exposed. As a result, the content of organic matter is low and tilth is poor.

The risk of erosion is serious on these soils. A cropping system can be used that is similar to the ones used on the less eroded Russell and Miami silt loams that have similar slopes. Yields are lower, however, and good stands of clover and alfalfa are harder to establish. Good management is required to maintain the present yields or to increase them and to prevent further losses of plant nutrients through erosion. (Management group 1D.)

Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded (RuC1).—These soils are more sloping than Russell and Miami silt loams, 0 to 2 percent slopes, but they are otherwise similar. They occur near other Russell and Miami silt loams.

Much of this soil is in forest or pasture. The soils are managed about the same as Russell silt loam, 6 to 12 percent slopes, slightly eroded. If they are cropped intensively, they are likely to erode. Suitable practices are required to control erosion and to maintain the present yields. (Management group 1E.)

Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded (RuC2).—These soils have lost part of the original surface layer through erosion. The present surface layer is 3 to 8 inches thick.

The soils erode easily. They need to be managed carefully to prevent further erosion. If the soils are used for row crops, they should be terraced and tilled on the contour. (Management group 1F.)

Russell and Miami soils, 6 to 12 percent slopes, severely eroded (RvC3).—These soils have lost all but 3 or 4 inches of the original surface soil through erosion. In many places the subsoil has been exposed by tillage. The present plow layer is grayish brown to yellowish brown and has a texture of silt loam or silty clay loam. Some areas have many gullies, and some are dissected by gullies. These soils are strongly acid and are low in plant nutrients and organic matter. They have poor tilth.

These soils erode easily. The larger areas are generally used for pasture; some of the more severely eroded and gullied areas are reverting to timber. The soils have a limited use for alfalfa or for other meadow and permanent pasture crops, but yields are low. Special care is needed to control erosion, to maintain the present yields, and to increase the supply of plant nutrients. (Management group 1G.)

Shoals Series

The soils of the Shoals series are somewhat poorly drained. They occur along meander channels and bayous and in depressions on flood plains. They have formed in recently deposited alluvium. The alluvium was washed from soils formed under forest in highly calcareous glacial drift of Wisconsin age. The native vegetation was a dense forest made up of sycamore, soft maple, elm, ash, cottonwood, and other water-tolerant trees.

These soils are in the same catena as the well drained Genesee soils, the moderately well drained Eel soils, and the very poorly drained, dark-colored Sloan soils. They are in the Alluvial great soil group.

Some areas of Shoals soils are at elevations high enough above the flood plain that they are seldom flooded. In these areas the soil has been in place long enough to show some profile development; the B horizon has weak textural and structural development, and the soil is slightly acid. Otherwise, the soils in these areas are similar to the Shoals soils on lower areas. Only one soil of this series, Shoals silt loam, is mapped in Fayette and Union Counties.

Profile of Shoals silt loam:

A_p 0 to 10 inches, grayish-brown (10YR 5/2), heavy silt loam mottled with dark yellowish brown (10YR 4/4); weak, moderate, fine, granular structure; firm when moist, slightly plastic when wet, and slightly hard when dry; neutral to slightly alkaline.

C_1 10 to 20 inches, grayish-brown (10YR 5/2), heavy silt loam mottled with dark brown (7.5YR 4/2); moderate, fine to medium, subangular blocky structure; firm when moist, plastic when wet, and slightly hard when dry; moderate content of organic matter; neutral to slightly alkaline.

C_2 20 to 28 inches, brown (10YR 5/3), heavy silt loam mottled with dark yellowish brown (10YR 4/4); moderate, fine, granular structure; firm when moist, plastic when wet, and hard when dry; neutral to slightly alkaline.

C_3 28 to 36 inches, dark grayish-brown (10YR 4/2), heavy silt loam to silt loam mottled with dark brown (7.5YR 4/4); moderate, medium to coarse, subangular blocky structure; calcareous.

The texture of the surface soil ranges from silt loam to silty clay loam. In a few places sand and gravel occur at depths of 4 feet or more.

Shoals silt loam (Sh).—The profile of this soil is similar to the profile described for the series. Some areas on high bottoms are included, but the acreage was too small to map separately.

The use of this soil is limited by poor drainage. In many places it is hard to find an outlet for tile drains. Most of this soil is in swamp forests or in pasture. The better drained areas are used and managed the same as the adjoining Eel and Sloan soils. Planting is delayed frequently by rains until late in spring. Crops are drowned out frequently. (Management group 7B.)

Sloan Series

The Sloan soils are very poorly drained. They occur in marshy and seepy areas of bottom lands. From November to June the areas are likely to be flooded. The floods leave deposits of fresh alluvium on the soils. Many small areas of these soils are at the bases of terraces and uplands, where they are saturated most of the time by runoff water. Consequently, the soils have formed in a mixture of recent alluvium and deposits washed from soils formed from highly calcareous glacial drift. The native vegetation was a deciduous forest made up of elm, oak, hackberry, sycamore, willow, and other water-tolerant trees.

These soils are in the same catena as the well drained Genesee soils, the moderately well drained Eel soils, and the somewhat poorly drained Shoals soils. They are in the Humic Gley great soil group. Only one soil of this series, Sloan silt loam, occurs in Fayette and Union Counties.

Profile of Sloan silt loam:

A_p 0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable when moist, slightly plastic when wet, and soft when dry; moderate content of organic matter; neutral to mildly alkaline.

A_{12} 10 to 18 inches, very dark brown (10YR 2/2), heavy silt loam; weak, coarse, granular structure to weak, medium, blocky structure; firm when moist, sticky when wet, and slightly hard when dry; neutral to mildly alkaline.

B_g 18 to 45 inches, dark grayish-brown (10YR 4/2) silty clay loam mottled with yellowish brown (10YR 5/4 to 5/6); layers of silt and sand occur in places in the lower part of this horizon; texture and color are variable; the content of sand increases with depth; neutral.

C 45 inches +, mottled gray and brownish-yellow, stratified silt loam and loam with many lenses of silty clay loam; neutral to calcareous.

The texture of the entire profile is variable. In some places the profile contains a little more clay or sand than the typical profile. Other variations are in the color and content of organic matter in the A horizons and in the thickness of the various horizons. In areas that have the poorest drainage, the surface soil is darker than that of the typical soil and the subsoil is gray.

Sloan silt loam (Sn).—This soil occurs on the flood plains of the Whitewater River. The profile is the one described for the series. A small area of Sloan silty clay loam, too small to map separately, is mapped with this soil.

The use of Sloan silt loam is limited by wetness. In many places it is difficult to locate suitable outlets for drainage. If drained, the soil is productive. Because of the risk of flooding and the high content of nitrogen, it is not suited to small grains. Corn is the main crop, and it is grown for several years in succession. To help control weeds, a crop of soybeans, a small grain, or grass should be grown occasionally. (Management group 6B.)

Westland Series

The Westland soils are dark colored and are poorly drained to very poorly drained. They occupy level to depressed, broad flats on alluvial terraces and in valley trains. They have formed in a layer of silty and loamy outwash, 42 to about 60 inches thick, that overlies stratified, calcareous gravel and sand. Marsh grasses and swamp forests made up the original vegetation.

These soils are in the same catena as the Ockley soils, which are well drained, and occur near soils of the Martinsville and Fox catenas. They are similar to the very poorly drained Mahalasville soils, which are not mapped separately in these counties. The Westland soils, however, have more gravel in the lower part of the B horizon, and they are underlain by sand and gravel rather than by finer textured materials. The soils of the Westland series belong to the Humic Gley great soil group. Only one soil of this series, Westland silt loam, occurs in Fayette and Union Counties.

Profile of Westland silt loam:

A_p 0 to 8 inches, very dark brown (10YR 2/2) to black (10YR 2/1) silt loam; strong, medium, granular structure; firm when moist, plastic when wet, and hard when dry; abrupt, smooth boundary; neutral.

A_{12} 8 to 13 inches, very dark gray (10YR 3/1) to very dark brown (10YR 2/2) silt loam; weak to moderate, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; neutral to slightly acid.

B_{21g} 13 to 25 inches, dark-gray (10YR 4/1) silty clay loam mottled with yellowish brown (10YR 5/4); moderate, medium to coarse, subangular blocky structure; slightly acid to neutral.

B_{22g} 25 to 55 inches, yellowish-brown (10YR 5/6) clay loam mottled with grayish brown (10YR 5/2) and dark gray (10YR 4/1); firm when moist, plastic when wet, and hard when dry; moderate, medium to coarse, angular blocky structure; the texture becomes coarser with increasing depth; neutral.

D 55 inches +, gray (10YR 6/1 to 5Y 5/1), stratified sand and gravel; a few, fine, distinct mottles of yellowish brown (10YR 5/6); calcareous.

The surface layer ranges from 10 to about 15 inches in thickness. The soils have a somewhat thicker solum in areas that are near soils of the Ockley catena than in areas near soils of the Fox catena.

Westland silt loam (We).—most of this soil is on high alluvial terraces in the valley of the Whitewater River. A few small areas are on lower terraces near soils of the Fox series. In many places the soils are covered by a deposit of silt that was washed from soils on adjacent higher terraces or uplands.

Small areas of Mahalasville silty clay loam and Mahalasville silt loam, which are not mapped separately in these counties, are mapped with this soil. These areas were too small to map separately. The soils in these included areas are somewhat similar to the soil described for the series. The profile is finer textured throughout, however, than that of the Westland soils, and in the Mahalasville soils, sandy loam, silt loam, and silty clay loam occur at depths of 40 to 60 inches or more.

Westland silt loam is a productive soil. It requires drainage but, otherwise, has no serious limitations. It can be drained easily by open ditches or tile drains. The tile need to be spaced more closely in areas of the included Mahalasville soils than in the Westland soil because the subsoil in the Mahalasville soils has a heavier texture.

If adequately drained, this soil is best suited to corn and soybeans. It is not well suited to wheat, redclover, and alfalfa, because these crops are frequently damaged by standing water. Corn, which is the principal crop, makes high yields. If corn and other row crops are grown intensively, however, the organic matter in the soil is likely to become depleted and the tilth will become poor. (Management group 6C.)

Whitaker Series

The Whitaker soils are dark colored and are somewhat poorly drained. They have formed on outwash terraces containing stratified sand and silt that contains a small amount of gravel and clay. Surface runoff and internal drainage are slow, and the water table is high. The soils can be drained fairly easily, however, by the use of tile drains or open ditches. The native vegetation was mainly oak, hickory, maple, ash, elm, and other deciduous trees.

These soils are in the same catena as the Martinsville soils, which are well drained. This catena also includes the very poorly drained Mahalasville soils, which have not been mapped separately in these counties. The Whitaker soils resemble the Homer soils in color and drainage. They have formed in stratified sand and silt, however, rather than in stratified sand and gravel. The Whitaker soils are in both Fayette and Union Counties. They are mainly on outwash terraces, mostly near Fishers Creek in the eastern part of Fayette County. The Whitaker soils belong to the Gray-Brown Podzolic great soil group.

Profile of Whitaker silt loam (SW¼SW¼ sec. 15, T. 15 N., R. 11 E., Fayette County, Ind.):

- A_p 0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine, granular structure; friable when moist, slightly sticky when wet, and slightly hard when dry; moderate content of organic matter; neutral to slightly acid.
- A_2 7 to 13 inches, light brownish-gray (10YR 6/2) silt loam; moderate, fine, granular structure to weak, thin, platy structure; friable when moist, slightly plastic when wet, and slightly hard when dry; low content of organic matter; medium acid to strongly acid.
- B_1 13 to 21 inches, brown (10YR 5/3), light silty clay loam with yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; friable when moist, plastic when wet, and hard when dry; medium acid to strongly acid.
- B_{21} 21 to 29 inches, light brownish-gray (10YR 6/2) silty clay loam mottled with strong brown; strong, medium, subangular blocky structure; firm when moist, plastic when wet, and hard when dry; medium acid.
- B_{31} 29 to 38 inches, yellowish-brown (10YR 5/4) sandy loam with some gravel; weak, coarse to very coarse, subangular blocky structure; neutral.
- B_{32} 38 to 48 inches, light brownish-gray (10YR 6/2) sandy clay loam mottled with dark brown (10YR 4/3); moderate, coarse, blocky structure; firm when moist, plastic when wet, and hard when dry; neutral.
- B_{33} 48 to 60 inches, grayish-brown (10YR 5/2) sandy loam mottled with dark brown (10YR 4/3); neutral.
- C 60 inches +, gray (10YR 6/1) and yellow (10YR 7/6), stratified silt and fine sand; contains a small amount of gravel; calcareous.

The soils vary in color, in the texture of the various horizons, and in depth to calcareous material. In places the sequence of stratified material in the C horizon also varies. In some places the Whitaker soils grade to Homer soils. In such places the soils have more gravel in the lower part of the subsoil and in the substratum than the normal soil.

Whitaker silt loam, 0 to 2 percent slopes (WhA).—The profile of this soil is similar to the profile described for the series. Included in mapping, however, are some areas in which the texture is silt loam throughout, although the parent material was the same as that of the typical soil; these areas are mainly in the valley of Fishers Creek, southwest of Springersville in Fayette County.

The surface soil in these included areas is browner than that of the typical soil. The subsoil is yellowish brown to depths of 16 to 22 or more inches, and gray mottling occurs at greater depths. In these areas the soil is moderately well drained and tile drains have not been used so extensively as in the typical soil.

Also included in mapping are some areas in which the parent material was silt loam or light silty clay loam laid down in lakes or deposited in slack water. In these areas the soil is fairly free of sand and is heavier textured throughout than the typical soil. It is also less permeable and is not so easily drained by tiling.

Most areas of Whitaker silt loam, 0 to 2 percent slopes, are used for crops, but a small acreage is in woods. Generally, the soil must be drained before it can be used regularly for crops. If it is drained and fertilizer is added, the soil can be used intensively to grow row crops and small grains, especially corn and wheat, and high yields are obtained. Corn is often grown for 2 years in succession. Lime is required if clover and other legumes are to grow well. (Management group 5A.)

Whitaker silt loam, 2 to 6 percent slopes (WhB).—This soil has a profile similar to the one described for the series. Stronger slope and more rapid runoff have caused slight erosion. Most of the soil has 7 to 8 or more inches of the original surface layer remaining. In a few small areas, however, some of the subsoil has been mixed with the remaining surface soil by tillage. Internal drainage of the soil is slow.

Included with this soil in mapping is a small area underlain by finer textured materials than the materials that underlie the typical soil. This underlying material consists of slack-water deposits.

This soil requires practices to control erosion. Otherwise, it is managed about the same as the typical soil. If this soil is used for row crops, tillage should be on the contour and waterways should be grassed. (Management group 5B.)

Wynn Series

The Wynn soils are well drained and have gentle to moderately steep slopes. They occupy small areas, mainly in the southwestern part of Union County and in the southeastern part of Fayette County. Small areas occur in other parts of the two counties, however, on high slopes along the deeper valleys, generally near outcroppings of limestone. The soils have formed in a thin layer of loess that overlies a leached, shallow layer of glacial till that has a texture of loam or clay loam. The till is of Wisconsin age and overlies limestone bedrock. Surface runoff is medium to rapid; internal drainage is medium. The native vegetation was a forest made up of hard maple, beech, oak, hickory, and other deciduous trees.

The Wynn soils are similar to the Russell soils, but the underlying bedrock is at shallower depths. They belong to the Gray-Brown Podzolic great soil group.

Profile of Wynn silt loam:

A_1 0 to 2 inches, dark-brown (10YR 4/3), smooth silt loam; moderate, fine, crumb structure; friable when moist, slightly sticky when wet, and soft when dry; neutral to slightly acid.

A_2 2 to 9 inches, brown (10YR 5/3), smooth silt loam; moderate, fine, crumb structure; friable when moist, slightly sticky when wet, and soft when dry; medium acid.

B_1 9 to 15 inches, brown (10YR 5/3), light silty clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky when wet, and hard when dry; strongly acid.

B_2 15 to 30 inches, yellowish-brown (10YR 5/4), heavy silty clay loam; moderate, coarse, subangular blocky structure; firm when moist, very sticky when wet, and very hard when dry; very strongly acid.

B_3 30 to 40 inches, yellowish-brown (10YR 5/4), heavy silty clay loam to light silty clay; contains some rotted fragments of limestone; very firm when moist, very sticky when wet, and very hard when dry; slightly acid in lower part of horizon.

D_1 40 inches +, gray limestone bedrock or calcareous unconsolidated, light yellowish-brown (2.5Y 6/4) clay shale of the Ordovician period.

The lower part of the B_2 horizon ranges in texture from silty clay loam, if the soil formed in till, to silty clay, if it formed in limestone. In some areas there is a C horizon of silty clay loam glacial till, but in most places this horizon is absent or, if present, it is very thin. The soil also varies in the thickness of the various layers and in depth to limestone bedrock. Depth to the bedrock ranges from 40 to 60 inches, but generally it is somewhat deeper where the soil grades to Russell silt loam.

Wynn silt loam, 2 to 6 percent slopes, slightly eroded (WnB1).—This soil occurs in southwestern Union County near soils of the Russell series. Its profile is similar to the one described for the series, but generally depth to bedrock is somewhat greater. In most places the surface layer is 7 to 12 inches thick, but it is thinner in a few small, more severely eroded areas. In places the subsoil has been exposed by tillage.

The crops are similar to those grown on the nearby Russell soils. A cropping system is needed in which clean-tilled crops are grown less of the time than close-growing ones. Practices are also needed to reduce runoff, thus controlling erosion and increasing yields. (Management group 1B.)

Wynn silt loam, 2 to 6 percent slopes, moderately eroded (WnB2).—The profile of this soil is similar to the one described for the series, but this soil is eroded. Most of this soil is in southwestern Union County.

In most places the surface layer is 3 to 8 inches thick. In many places, however, the subsoil is exposed or tillage is partly in the subsoil. Consequently, the present plow layer ranges from light yellowish-brown silt loam to yellowish-brown silty clay loam and is 6 to 7 inches thick.

The content of organic matter is low in this soil, and tilth is poor. The supply of plant nutrients is lower than in Wynn silt loam, 2 to 6 percent slopes, slightly eroded.

To prevent erosion, sod waterways and till on the contour, or maintain a protective cover of plants by using a cropping system in which clean-tilled crops are grown less of the time than close-growing ones. Apply commercial fertilizer and lime according to the needs indicated by soil tests. (Management group 1C.)

Wynn silt loam, 6 to 12 percent slopes, moderately eroded (WnC2).—This soil occurs in both counties. It is more eroded than the soil described for the series, but it is otherwise similar. In many places from 3 to 8 inches of the original surface soil remains. In places, however, the light-colored subsoil is exposed. The soil is acid. It is low in organic matter and plant nutrients and has poor tilth.

This soil is likely to erode. Generally, it is better suited to small grains and meadow crops than to row crops. If it is used for row crops, practices are needed to prevent erosion and to maintain and improve the supply of plant nutrients and yields. (Management group 1F.)

Wynn silt loam, 12 to 25 percent slopes, moderately eroded (WnD2).—Most of this soil is near drainageways in southwestern Union County. The profile is similar to the one described for the series, but the layers are thinner and depth to bedrock is shallower. In most places one-fourth or more of the original surface soil has been lost through erosion and the remaining surface soil has been mixed with the heavier textured subsoil. As a result the present surface soil has a texture of silty clay loam. Depth to bedrock is generally about 24 inches.

Most of this soil is used for crops or permanent pastures. The pastures are generally of low quality and have a low carrying capacity; they need to be renovated and reseeded to legumes. Because of the steep slopes and risk of erosion, the areas should be kept in permanent pasture or should be reforested. (Management group 1J.)

Wynn soils, 6 to 12 percent slopes, severely eroded (WyC3).—These soils occur mostly in southwestern Union County. The profiles are similar to the one described for the series, but these soils have thinner layers and are shallower over bedrock.

These soils have lost three-fourths or more of the original surface soil through erosion. In some places all of the surface soil has been removed and, in places, part of the subsoil. In many small areas there are shallow gullies. The present surface soil varies, but generally it is brownish-yellow or brown silty clay loam that is 6 to 7 inches thick.

Formerly, these soils were all cultivated. Now, only a small part is in crops and yields are low. Most areas are in pasture. The pasture plants consist of a sparse growth of Kentucky bluegrass and various weeds. (Management group 1G.)

Xenia Series

The Xenia soils are nearly level to gently sloping and are light colored and moderately well drained. They occur on glacial till plains throughout Fayette and Union Counties. These soils have formed in silt that is 18 to about 36 inches deep and overlies loam to coarse clay loam glacial till of Wisconsin age. Runoff and internal drainage are both medium. The native vegetation consisted of beech, sugar maple, elm, and white, black, and pin oaks.

These soils are in the same catena as the well-drained Russell soils, the somewhat poorly drained Fincastle soils, the poorly drained Delmar and Cope soils, and the very poorly drained Brookston and Kokomo soils. The Delmar soils are light colored, and the Brookston and Kokomo are dark colored. The Xenia soils belong to the Gray-Brown Podzolic great soil group.

The Xenia and Celina soils have formed from similar materials, but the texture of the Xenia soils is smoother in the surface soil and in the upper part of the subsoil. The Xenia soils are also more acid in the upper part of the profile, and depth to calcareous material is greater. Although the Celina soils are not mapped separately in these counties, they are mapped as undifferentiated soil groups consisting of Xenia and Celina silt loams. The Celina series is described elsewhere in this report.

Profile of Xenia silt loam (sec. 36, T. 15 N., R. 13 E., Union County, Ind.):

A_p 0 to 7 inches, dark grayish-brown (10YR 4/2) to brown (10YR 4/3), smooth silt loam; moderate, fine, granular structure; friable when moist, slightly sticky when wet, and slightly hard when dry; medium acid.

A_2 7 to 11 inches, pale-brown (10YR 6/3), smooth silt loam; moderate, fine, granular structure to weak, platy structure; friable when moist, slightly sticky when wet, and slightly hard when dry; strongly acid.

B_1 11 to 17 inches, light yellowish-brown (10YR 6/4), smooth, light silty clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky when wet, and hard when dry; very strongly acid.

B_2 17 to 30 inches, light yellowish-brown (10YR 6/4), smooth silty clay loam with gray (10YR 6/1) and yellow (10YR 7/6) mottles; moderate, medium, subangular blocky structure; firm when moist, slightly sticky when wet, and hard when dry; strongly acid.

B_{22} 30 to 39 inches, yellowish-brown (10YR 5/4), gritty silty clay loam to clay loam; some pebbles in lower part of horizon; moderate, medium to coarse, angular blocky structure; firm when moist, sticky when wet, and hard when dry; strongly acid.

B_3 39 to 49 inches, light yellowish-brown (10YR 6/4), light clay loam; moderate, coarse, angular blocky structure; firm when moist, sticky when wet, and hard when dry; slightly acid to neutral.

C 49 inches +, yellowish-brown (10YR 5/6) loam to coarse clay loam glacial till of Wisconsin age; calcareous.

The soils vary in color and texture and in the thickness of the various horizons. Depth to calcareous till also varies; the range is from 42 to about 70 inches, but in most places it is about 46 inches.

Xenia silt loam, 0 to 2 percent slopes (XeA).—This soil occurs in both counties. Its profile is similar to the profile described for the series. Included in mapping are a few moderately eroded areas that were too small to map separately.

This productive soil has no serious limitations, but it needs fertilizer and lime. In many places it is cropped intensively. Corn, the main crop, is often grown for 2 years in succession, if additional feed is needed, and the yields are medium to high. (Management group 1A.)

Xenia silt loam, 2 to 6 percent slopes, slightly eroded (XeB1).—This soil occurs in both counties. It is along streams and on gently sloping knolls and ridges on the divides between streams. The soil is slightly eroded because water runs off readily and causes erosion, but otherwise the profile is similar to the profile described for the series. In some small areas erosion has been severe and tillage has exposed the yellowish-brown subsoil.

This productive soil is likely to erode. If used for row crops, it needs to be tilled on the contour and waterways should be sodded. Otherwise, the soil can be used and managed about the same as Xenia silt loam, 0 to 2 percent slopes. (Management group 1B.)

Xenia silt loam, 2 to 6 percent slopes, moderately eroded (XeB2).—This soil is similar to Xenia silt loam, 2 to 6 percent slopes, slightly eroded, but it is more eroded. In most places only 3 to 8 inches of the original surface soil remains. In some of the more severely eroded areas, the present plow layer is yellowish brown and contains more clay than the original surface soil. In these areas hard clods tend to form if the soil is tilled when wet.

Most of this soil has been used intensively to grow clean-tilled crops. This has accelerated the loss of surface soil through erosion. Consequently, the content of organic matter has been lowered, the supply of plant nutrients depleted, tilth impaired, and the moisture-absorbing capacity reduced.

Erosion has caused yields to become lower on this soil. The yields can be improved by building up the content of organic matter and by applying lime, commercial fertilizer, and manure. In addition, till on the contour, use terraces, and keep waterways in grass. (Management group 1C.)

Xenia and Celina silt loams, 0 to 2 percent slopes (XnA).—These soils occur in large areas in the eastern part of Union County and in small areas in the west-central and southeastern parts of Fayette County. They have formed in loess that overlies loam to coarse clay loam glacial till. The loess ranges from 15 to 30 inches in thickness, but in most places it is about 24 inches thick. The glacial till is highly calcareous. It occurs at depths between 24 and 42 inches, but it is generally at depths of about 36 inches.

In some places the soils are similar to the typical Xenia soils in the thickness of the silt and in depth to calcareous till. In others, the soils are gritty throughout and are similar to the typical Celina soil.

These soils are productive. They have no serious limitations, but they need fertilizer and lime. They are cropped intensively in many places. Corn is the principal crop. It is often grown for 2 years in succession if it is needed for feed. The yields are medium to high. (Management group 1A.)

Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded (XnB1).—These soils occur in both counties. They are on gently sloping knolls and ridges on the divides between streams. The soils are similar to Xenia and Celina silt loams, 0 to 2 percent slopes, but they are more sloping and eroded. In some small areas the yellowish-brown subsoil has been exposed by tillage.

These soils are productive, but they are likely to erode if they are not protected by a cover of plants. If row crops are grown, contour tillage is needed and waterways should be sodded. Otherwise, the soils can be used and managed about the same as Xenia and Celina silt loams, 0 to 2 percent slopes. (Management group 1B.)

Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded (XnB2).—These soils are similar to the other Xenia and Celina silt loams, but they are more eroded. In most places all but 3 to 8 inches of the original surface soil has been lost through erosion. In some of the more severely eroded areas, the present plow layer is yellowish brown and contains more clay than the plow layer in the uneroded soil. If the soils are tilled when wet, hard clods tend to form.

Most areas of these soils have been used to grow cultivated crops, which has accelerated the erosion. Yields have been lowered as a result of erosion. The yields can be improved if the content of organic matter is built up and if lime, commercial fertilizer, and manure are added. Tilling on the contour, terracing, and sodding the waterways will help to control erosion. (Management group 1C.)

Factors of Soil Formation

Everyone who has worked with soils has noticed that they differ from place to place. In one end of a field, there may be deep, productive soils, and, in the other, shallow, droughty soils. The differences do not occur at random. The soils differ because the five factors of soil formation—parent material, topography, climate, living organisms, and time—vary from place to place. For example, some soils are gravelly because their parent material was glacial till that contained gravel. Others are silty because their parent material was loess.

Differences in natural vegetation cause differences in the soils; for example, some soils are dark colored because they have formed under grasses, and others are light colored because they have formed under trees. Relief also causes differences—some soils are shallow because they have formed on steep slopes, and others are deeper because they have formed on less steep slopes; some are wet because they occur in low areas where water does not drain away. Time likewise affects soils. The soils along streams, for example, are said to be young because sediments are still being deposited. These soils have not had time to develop well-defined horizons.

In addition to the interaction of the five factors of soil formation, man's past use of the soil has also caused differences. A striking example of man's effect on the soils can be seen in hilly areas that have been stripped of vegetation and then tilled. Here, the surface soil has been lost through erosion and the subsoil has been exposed. In some places gullies have formed.

Parent Materials

The soils in Fayette and Union Counties have formed mainly from four kinds of parent material. These are (1) ice-laid material, or glacial drift; (2) wind-laid silt, or loess; (3) water-laid deposits, or alluvium; and (4) weathered products of limestone and shale.

Glaciation has been important in the formation of the soils in these two counties. Glacial drift accumulated during the advance and retreat of great ice sheets. These huge ice sheets, hundreds of miles wide and thousands of feet thick, moved slowly southward across the countryside. As they moved, valleys were filled, hills were leveled, and new hills were left where none had been before.

As the glaciers advanced, they picked up masses of rock, sand, silt, and clay, weathered from the bedrock, and ground it together forming rock flour. When the ice melted, it deposited the varied material as glacial drift. The geologic materials left by the ice sheets, or glaciers, are of two kinds: (1) Till, or compact, relatively unassorted silt, clay, sand, and gravel; and (2) outwash, or water-sorted sand and gravel. Both kinds of material contain considerable amounts of ground-up limestone and shale.

Because the glacial drift is made up of many different kinds of bedrock, it contains many different minerals. Thus, soils formed in glacial drift generally are productive. In contrast, soils weathered from bedrock have only such minerals as were contained in that particular bedrock.

Glaciers of at least three different ages—the Kansan, the Illinoian, and the Wisconsin—have deposited till in Fayette and Union Counties.[2] Recent studies indicate that the Kansan glacial age preceded the other two glacial ages.[3] Materials of Kansan age were completely covered, however, by till of Illinoian age, and in these counties no soils are known to have formed in material of Kansan age.

The earlier deposits from which soils were formed were laid down during the Illinoian glacial age. Later, in Union County and in the northernmost three-fourths of Fayette County, these deposits were covered by glacial till left during the Tazewell substages of the Wisconsin age. The resulting till plains have been exposed to weathering; they provide the material in which most of the soils have formed.

Soils formed in till left by the Illinoian glacier are old soils. In many places they are leached free of lime to depths of 10 or more feet, which indicates that weathering has taken place over a long period of time. After the ice of the Wisconsin glacier melted, other soils formed. These younger soils are leached free of lime to depths of 40 to 55 inches. The glacier, in a later advance during the Tazewell substage, covered about 15 square miles in what is now the northern part of Posey Township. Here, the soil is leached free of lime to depths of only 12 to 30 inches, indicating that the soil is still younger.

The later glacier of the Tazewell substage covered only a small part of these two counties, but it altered soil-forming conditions. As the ice melted during the summer, it caused floodwaters to cover large areas of what is now the Whitewater River bottoms, and these waters deposited ground-up rock as rock flour. In fall and winter, the melting ceased; the areas became mud flats and then dried out. Dust from these dry mud flats was blown by winds onto the uplands. This silty, wind-deposited material of the uplands is called loess.

The deposits of loess range in thickness from 1 to 5 feet or more. The glacial till plains of Illinoian age and of the first Tazewell substage were covered by these deposits. In many of the level areas, the soils have formed entirely in loess. In rolling to steep areas, geological erosion removed the loess as fast as it was laid down. In such places the soils have formed largely in glacial till.

[2] MALOTT, CLYDE A. THE PHYSIOGRAPHY OF INDIANA. Handb. of Ind. Geol. Dept. of Conserv., Pub. No. 21: 59–256, illus. 1922.

[3] WAYNE, WILLIAM J. THICKNESS OF DRIFT AND BEDROCK PHYSIOGRAPHY OF INDIANA NORTH OF THE WISCONSIN GLACIAL BOUNDARY. Ind. Dept. of Conserv. Geol. Survey Rpt. of Prog. No. 7, 70 pp., illus. 1956.

The soils formed in loess differ from soils formed in glacial till in being smooth and silty, rather than gritty or gravelly. An example of soils formed in loess are those of the Manlove catena, which are on upland flats. The Russell and Cincinnati soils, on rolling, steeper areas, have formed largely from underlying glacial till that contains much grit and small pebbles.

Soils formed in water-laid or alluvial materials vary. On the high bottoms, or terraces, the soils are older than those on the flood plain and have formed from assorted materials deposited by melting ice. The materials deposited by the ice are known as outwash and contain considerable gravel. The Ockley soils have formed in such deposits. On the first bottoms, or flood plains, are the Genesee soils. These younger soils have formed in silty, water-laid materials, or alluvium. Areas of such soils are frequently flooded, and fresh deposits of alluvial material are laid down.

On steep areas are soils that overlie beds of flaggy limestone and limy shale. Such soils have formed in place from weathered products of these very old materials. The Fairmount soils are an example.

Topography

The relationship of topography to the soils and the position of typical soils on the landscape in relation to their parent material are shown in figure 7. This schematic cross section of Fayette county also indicates the kind of vegetation under which the soils formed and their natural drainage.

Topography influences soil formation by its effect on moisture, erosion, temperature, and plant cover. The topographic features of an area are determined partly by the underlying materials, climate, and vegetation, and partly by other factors. Much of the effect of topography on soil is dependent on the other four factors of soil formation.

Topography affects the thickness and content of organic matter in the surface soil; the depth of the solum; drainage, which, in turn, affects the color and degree of mottling; and the degree of horizon differentiation. Generally, the soils of an area are formed from similar parent material, although slopes differ. In rough country, however, the underlying rock formations of different periods are often exposed so that there is a complex pattern of soils formed from different parent materials. The land forms typical of Fayette County are shown in figure 8.

The soils are closely related to the land forms of an area. Where slopes are steep, such as in the Hennepin soil areas in these two counties, the soil materials are removed by runoff water almost as fast as they are deposited and the soils are shallow and poorly developed. In the more nearly level areas, there is less runoff and the soils have had time to form characteristic layers, or horizons.

Climate

The effect of climate upon soil development can be seen in the soils in broad areas. Climate largely deter-

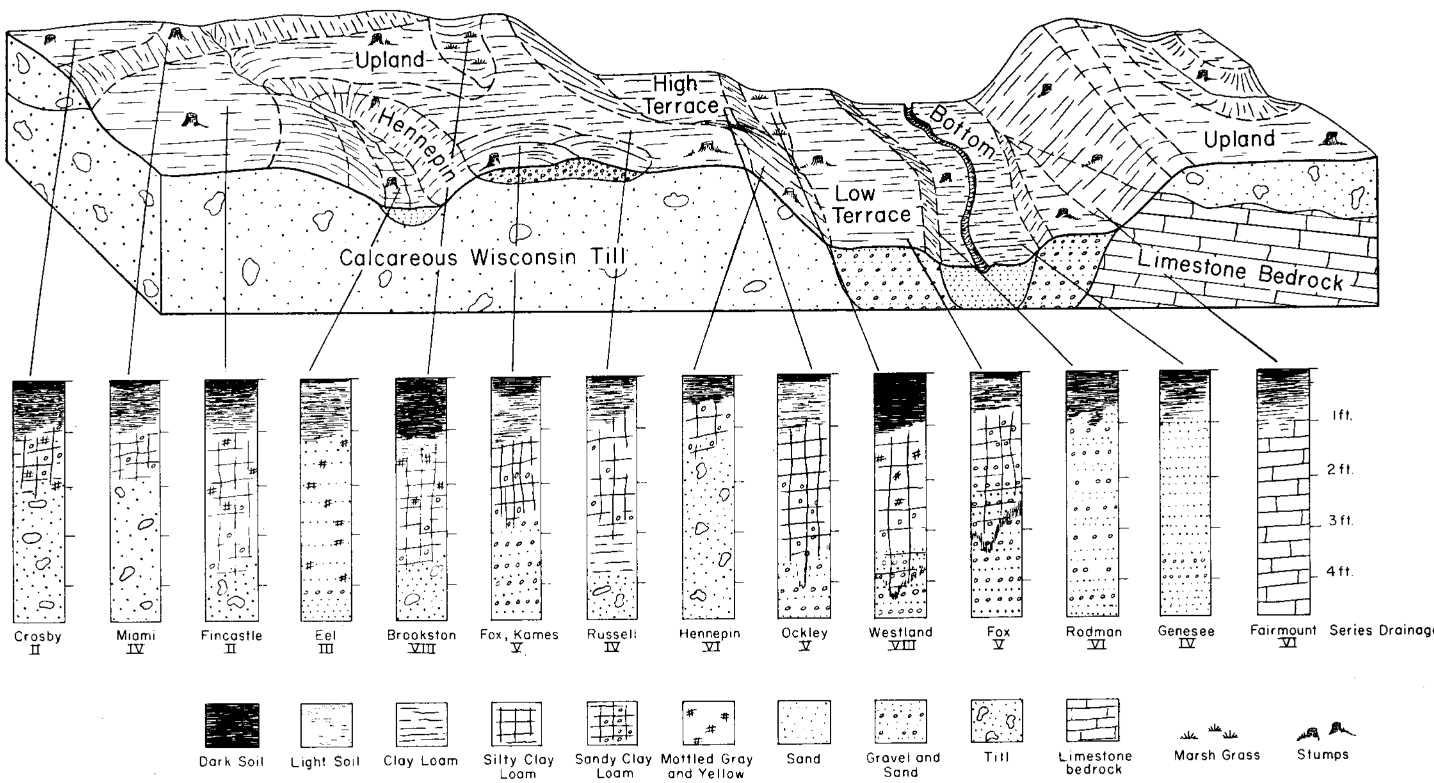

Figure 7.—**Schematic cross section of Fayette County showing soil series, parent material, native vegetation, and drainage. Drainage is indicated by Roman numerals below each profile as follows: II, somewhat poor; III, moderately good; IV, good; V, good to excessive; VI, excessive; VII, poor; and VIII, very poor.**

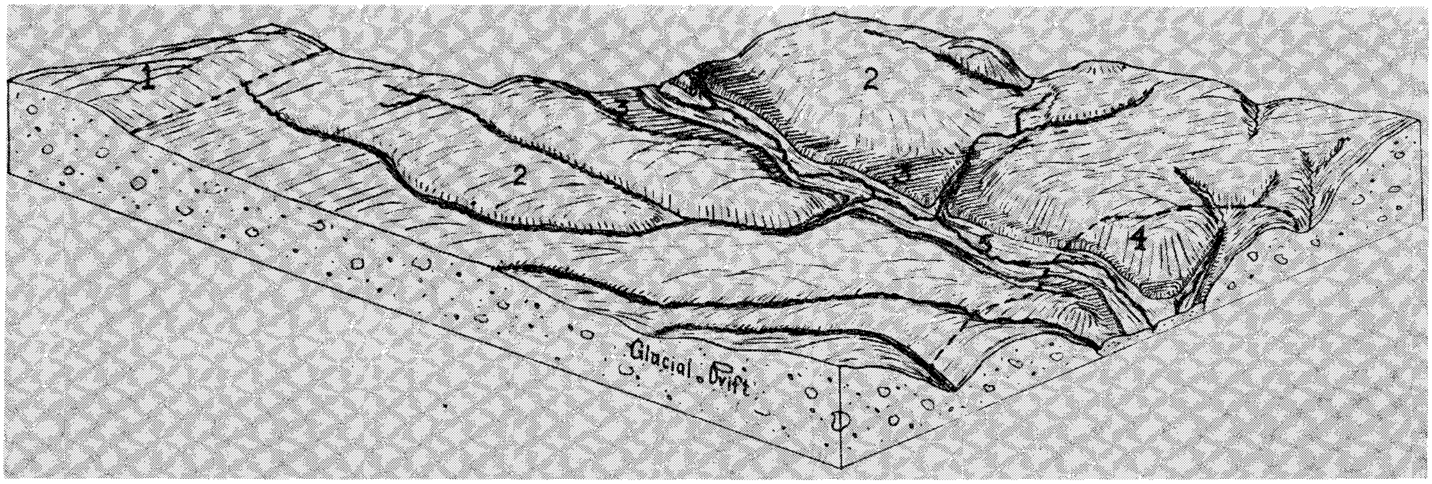

Figure 8.—**Diagram showing land forms typical of Fayette County: (1) Till plain of Late Wisconsin age; (2) somewhat dissected till plain of Early Wisconsin age; (3) glaciofluvial river terraces of Wisconsin age; (4) greatly dissected glacial till area of Illinoian age; and (5) river bottom alluvium.**

mines the type of vegetation growing in an area, which, in turn, affects the soils. For example, the vegetation is generally sparse in an area of little rainfall. As a result, the soils differ from soils such as those in eastern Indiana, which have formed where precipitation is heavier. Throughout Fayette and Union Counties, the climate is fairly uniform. The differences among the soils within the two counties are related to factors other than to differences in climate.

Living Organisms

Although native vegetation has been the main living influence in the formation of soils in these two counties, earthworms and other forms of life in and on the soil have also contributed. Plants, bacteria, earthworms, and other forms of life form organic matter or humus, which gives a dark color to the surface soil.

In these counties, the native vegetation was made up mainly of trees, but many areas had a cover of swamp forest, and some may have had a cover of prairie grasses. Trees deposit twigs and leaves only on the surface and have comparatively few roots; therefore, they add little organic matter to the soil. Soils formed under forest have a fairly thin, light-colored surface layer. In contrast, soils formed in swampy areas have a deep, dark surface layer because they have accumulated more organic matter from the trees and plants covering them. Furthermore, the areas are wet much of the time and the organic matter is kept from oxidizing. Soils formed under grasses have a thicker, darker surface layer than those formed under forest because grasses have many roots that decay in the soil.

Time

Some of the soils in this area are old. They have formed in glacial till, or in loess, or from weathered rock. These soils have been in place long enough for well-defined horizons to have developed. Among these are the Cincinnati soils, which have formed in glacial till of Illinoian age, and the Manlove soils, formed in loess.

Other soils are young because they are forming near streams that overflow their banks from time to time and add fresh deposits; the Genesee soils are examples of these soils. Some soils on steep slopes are young because the soil materials are washed away before distinct horizons have time to form.

Past Use

Man's past use of the soil has brought about striking changes in the soils in this area. Because of tillage, soils in many sloping areas are eroded. In such places the friable silt loam surface soil has been partly or entirely removed by erosion, and this has caused losses of organic matter and plant nutrients. The present surface soil in eroded areas contains varying amounts of sticky clay loam from the subsoil. As a result, it is deficient in nutrients and tillage is difficult. Consequently, soils within one soil type differ markedly because of past use and require different care to remain productive.

Classification of Soils by Great Soil Groups

The characteristics of the great soil groups are discussed in the following pages. The representative soil series are described under each group in alphabetical order. A more detailed description of each series is given in the section, Soil Series and Mapping Units.

The great soil groups in Fayette and Union Counties are (1) Gray-Brown Podzolic soils, (2) Planosols, (3) Humic Gley soils, (4) Brown Forest soils, (5) Regosols, (6) Rendzinas, and (7) Alluvial soils. Some of the soils are not representative of the central concept of any one great soil group.[4] The Cincinnati soils, for example, have been classified as Gray-Brown Podzolic soils but intergrade toward the Red-Yellow Podzolic great soil group, which is not otherwise represented in these counties.

[4] For definitions of the great soil groups see, Glossary, SOIL, U.S. Dept. Agr. Yearbook 1957: pp. 751–770.

TABLE 4.—*Soil series classified by great soil groups,*

[Roman numerals in the column heads are those used in the Indiana system of designation of major soil profiles;[1] all of the series under the

Parent material	Gray-Brown Podzolic soils				Gray-Brown Podzolic soils, intergrading to Red-Yellow Podzolic soils	Planosols
	Nearly level to strongly sloping		Nearly level to gently sloping	Nearly level	Gently sloping to steep	Nearly level
	Well drained to excessively drained V	Well drained IV	Moderately well drained III	Somewhat poorly drained II	Well drained IV	Somewhat poorly drained II
Loess, 10 to 72 inches thick, over calcareous loam to clay loam glacial till of Illinoian age; strongly leached to depths of 10 or more feet.					Cincinnati	Avonburg
Loess, 18 to 40 inches thick, over highly calcareous loam to light clay loam glacial till of Wisconsin (Early Tazewell) age; leached to depths of 42 to 60 or more inches.		Russell	Xenia	Fincastle		
Highly calcareous loam to light clay loam glacial till of Wisconsin (Late Tazewell) age; leached to depths of 13 to 42 inches.		Miami	Celina	Crosby		
Loess, 36 to 65 inches thick, over loamy glacial till of Wisconsin age; generally calcareous at depths of 36 or more inches.		Manlove	Birkbeck	Reesville		
Loess and loamy glacial till of Wisconsin (Early Tazewell) age over limestone of Ordovician period; generally leached.		Wynn				
Soft, marly and flaggy limestone of Ordovician period.						
Medium-textured glacial drift of Wisconsin age, 18 to 42 inches thick, over limestone terraces.		Milton				
Stratified sand, silt, and some clay of Wisconsin age; calcareous at depths of 42 to 60 inches.		Martinsville.		Whitaker		
Silty and loamy outwash, 42 or more inches thick, over highly calcareous gravel and sand.	Ockley					
Silty and loamy outwash, 24 to 42 inches thick, over highly calcareous gravel and sand.	Fox			Homer		
Loamy outwash, 12 to 36 inches thick, over highly calcareous gravel and sand.						
Loamy outwash, less than 18 inches thick, over highly calcareous gravel and sand.						
Medium-textured, neutral to alkaline alluvium, chiefly from glacial drift of Wisconsin age.						

[1] BUSHNELL, T. M. THE STORY OF INDIANA SOILS. Purdue Univ. Agr. Expt. Sta. Spec. Cir. 1, 52 pp., illus. 1944.
[2] Has some characteristics of Regosols.

Table 4, shows the great soil groups in the two counties and gives the drainage, relief, and parent material for each series. The soil series listed in one horizontal line have formed from similar parent material; differences in the profiles have largely been caused by differences in drainage that prevailed when the soils were forming. Such a grouping of soil series is called a catena. The soils listed under a given Roman numeral have similar natural drainage. They differ in profile characteristics, however, because they have formed from different kinds of parent materials.

Gray-Brown Podzolic Soils

The Gray-Brown Podzolic soils have thin, dark-colored, organic (A_0) coverings and organic-mineral (A_1) layers. The organic-mineral layers overlie a grayish-brown, leached A_2 horizon that, in many places, has a platy structure. The B horizon is generally finer textured than the A, C, or D horizons and has a moderate, subangular to angular, blocky structure. The clay in the B_2 horizon has probably accumulated as the result of downward movement from the A horizon as well as through formation in place.

and relief, drainage, and parent material of each series

same numeral are generally similar in topography and drainage, and all have profiles that are generally similar in kind and sequence of layers]

Plano-sols—Con.	Humic Gley soils			Brown Forest soils	Regosols, intergrading to Gray-Brown Podzolic soils	Rendzinas	Alluvial soils		
Level	Nearly level to slightly depressed	Nearly level to depressed		Nearly level	Steep to very steep	Steep	Nearly level	Nearly level to slightly depressed	Nearly level to depressed sloughs and meander channels
Poorly drained	Poorly drained	Very poorly drained	Very poorly drained to ponded	Well drained to excessively drained	Excessively drained	Excessively drained	Well drained	Moderately well drained	Somewhat poorly drained
I	VII	VIII	IX	V	VI	VI	IV	III	II
Delmar	Cope	Brookston	Kokomo						
		Brookston	Kokomo		Hennepin				
						Fairmount			
		Westland							
				Nineveh					
				Rodman [2]					
		Sloan [3]					Genesee Ross.	Eel	Shoals.

[3] Sloan is a Humic Gley soil somewhat modified by recent deposition.

These soils have formed under a forest made up of various kinds of hardwoods. They have neutral A_0 and A_1 horizons and medium acid to strongly acid B horizons. The soils in this group range in drainage from excessively drained to somewhat poorly drained.

Well-drained to Excessively Drained, Gray-Brown Podzolic Soils

The soils of this group are members of the Fox and Ockley series.

Fox soils have formed in silty and loamy outwash, 24 to 42 inches thick, over calcareous gravel and sand. The solum is well developed and generally is about 36 inches thick; the lower half is gravelly in most places.

Ockley soils have formed in silty outwash or loessal silt, 18 to 36 or more inches thick. They have a well-developed B horizon that extends to calcareous gravel and sand, which is at depths of 42 to 72 inches. The Ockley soils are on the older and higher terraces of valley trains.

Well-drained Gray-Brown Podzolic Soils

The members of this group are soils of the Manlove, Martinsville, Miami, Milton, Russell, and Wynn series.

Manlove soils have formed in loess, 36 to 65 inches thick, over calcareous loam to coarse-textured clay loam glacial till of Wisconsin age. In most places the soil over the till is leached. The leaching was probably caused by the lateral movement of water, over the more slowly permeable till. The water seeped out on the slopes and ran down the slopes to drainageways. Table 5 gives the results of mechanical and chemical analyses of a sample of Manlove silt loam.

Martinsville soils have formed in stratified sand and silt that includes thin strata of clay and some fine gravel. These soils are calcareous at depths of 42 to 60 inches.

Miami soils have formed in loamy till that is leached to depths of 13 to 42 inches. The till in this area, particularly in Fayette County, is highly calcareous. It is leached in a number of places to depths of 24 inches, but in many places depth to calcareous till is less than 20 inches.

Milton soils have formed in medium-textured glacial drift, 18 to 42 inches thick, that overlies limestone. The drift has been leached of carbonates.

Russell soils are the dominant well-drained soils of the Gray-Brown Podzolic group in this area. They have formed in loess, 18 to 36 inches thick, that overlies weathered loam to coarse-textured clay loam glacial till of Early Wisconsin age. In most places depth to calcareous till is about 46 inches, but it ranges from 42 to 60 or more inches. Table 6 gives the results of mechanical and chemical analyses of a sample of Russell silt loam.

Wynn soils have formed in shallow deposits of glacial till of Wisconsin age. The till is underlain by limestone bedrock. It is generally 30 to 45 inches thick and is leached throughout. In places the soils have formed, in part, from materials weathered from the limestone. Here the solum has a higher content of clay than that of the normal soil.

Moderately Well Drained Gray-Brown Podzolic Soils

In this group are soils of the Birkbeck, Celina, and Xenia series.

Birkbeck soils are nearly level. They are on till plains and in most places border the front of the Champaign moraine. In some places they are in valley trains. The soils have formed in loess, or windblown silt, that is 36 to 60 inches or more thick. The loess overlies calcareous loam to coarse-textured clay loam glacial till of Wisconsin age.

Celina soils are not mapped separately in these counties but are mapped with the Xenia soils in undifferentiated soil groups. They have formed in a layer of silt that is thicker than that in which the typical Celina soils formed. The layer of silt, in most places, is 8 to 18 inches thick over leached loam till that overlies calcareous till. The calcareous till is at depths ranging from 24 to 45 inches, but, in most places, it is at a depth of about 34 inches.

TABLE 5.—*Analytical data for Manlove silt loam (SW¼NE¼ sec 20., T. 15 N., R. 12 E., Fayette County, Ind.)*

MECHANICAL ANALYSES

Horizon	Depth	Size class and diameter of particles (in mm.)							Other classes (in mm.)	
		Very coarse sand, 2.0–1.0	Coarse sand, 1.0–0.5	Medium sand, 0.5–0.25	Fine sand, 0.25–0.1	Very fine sand, 0.1–0.05	Silt, 0.05–0.002	Clay, <0.002	0.02–0.002	>2.0
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
A_p	0–5	0.3	1.1	2.0	4.4	5.1	70.3	16.8	34.0	0.5
A_2	5–12	.7	1.4	1.9	4.5	5.1	70.0	16.4	33.4	2.0
B_1	12–17	.3	1.0	1.7	4.0	4.5	68.9	19.6	32.5	.5
B_2	17–32	.1	.6	1.7	4.2	6.6	59.9	26.9	21.7	.5
B_3	32–45	0	.5	1.5	4.1	6.2	60.1	27.6	24.7	.5
C_1	45–65	.5	1.0	1.1	2.6	3.0	67.8	24.0	35.3	1.0
D	65+	3.2	5.8	6.9	15.8	9.8	33.7	24.8	19.8	10.0

CHEMICAL ANALYSES

Horizon	Depth	pH	Exchangeable cations (meq./100 gm.)						Base saturation	Organic carbon
			Ca	Mg	K	Na	H	Sum of cations		
	Inches								*Percent*	*Percent*
A_p	0–5	7.2	8.6	3.2	0.2	(1)	3.5	15.5	77	1.09
A_2	5–12	7.0	6.7	2.9	.2	(1)	3.8	13.6	72	.78
B_1	12–17	6.4	7.0	3.0	.1	(1)	5.1	15.2	66	.86
B_2	17–32	5.1	8.0	2.8	.2	.1	7.9	19.0	58	.18
B_3	32–45	5.4	8.2	2.9	.2	.1	7.8	19.2	59	.16
C^1	45–65	6.1	9.5	4.0	.2	.1	5.1	18.9	73	.15
D	65+	7.6	(2)	------	------	------	------	------	------	.32

[1] Less than 0.1.

[2] Calcareous.

TABLE 6.—*Analytical data for Russell silt loam (NW¼SE¼ sec. 6, T. 13 N., R. 13 E., Fayette County, Ind.)*

MECHANICAL ANALYSES

Horizon	Depth	Size class and diameter of particles (in mm.)							Other classes (in mm.)	
		Very coarse sand, 2.0–1.0	Coarse sand, 1.0–0.5	Medium sand, 0.5–0.25	Fine sand, 0.25–0.1	Very fine sand, 0.1–0.05	Silt, 0.05–0.002	Clay, <0.002	0.02–0.002	>2.0
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
A_0 [1]	¼–0									
A_{11}	0–½	0.3	0.7	1.4	3.6	4.8	68.2	21.0	36.6	0.5
A_{12}	½–6	.1	.6	1.5	3.8	4.7	69.3	20.0	36.4	.5
A_{22}	6–11	0	.5	1.4	3.6	5.2	68.5	20.8	35.8	.5
B_1	11–14	0	.5	1.3	3.5	5.1	68.7	20.9	35.7	.5
B_2	14–34	.1	.7	2.1	6.4	9.9	57.9	22.9	25.7	.5
B_3	34–45	1.1	2.8	5.9	16.6	17.3	39.2	17.1	16.8	3.0
C_1	45+	3.6	4.4	4.0	8.3	5.5	43.5	30.7	33.8	7.0

CHEMICAL ANALYSES

Horizon	Depth	pH	Exchangeable cations (meq./100 gm.)						Base saturation	Organic carbon
			Ca	Mg	K	Na	H	Sum of cations		
	Inches								*Percent*	*Percent*
A_0 [1]	¼–0	[2] 6.3								
A_{11}	0–½	6.6	18.9	4.1	0.4	0.1	6.9	30.4	77	4.35
A_{12}	½–6	6.4	12.0	3.2	.3	.1	6.8	22.4	70	2.29
A_{22}	6–11	6.2	9.6	2.9	.2	.1	7.0	19.8	65	1.70
B_1	11–14	6.3	9.3	2.7	.2	.2	5.9	18.3	68	1.30
B_2	14–34	6.1	8.5	3.2	.3	.1	7.0	19.0	63	.20
B_3	34–45	6.2	6.2	2.4	.2	.1	4.1	13.0	68	.10
C_1	45+	7.8	(3)							.28

[1] Organic layer not analyzed.
[2] The pH is generally 5.5 to depths of about 3 feet.
[3] Calcareous.

Xenia soils have formed in loess, 18 to 36 inches thick, that overlies loam to coarse-textured clay loam glacial till. The till is calcareous at depths of 42 to 60 or more inches. Throughout eastern Union County there are extensive areas of Xenia and Celina silt loams. These are on smooth areas but are moderately well drained. These soils have a mantle of silt, 15 to 30 inches thick, and are generally calcareous at depths of less than 42 inches.

SOMEWHAT POORLY DRAINED GRAY-BROWN PODZOLIC SOILS

The soils of this group belong to the Crosby, Fincastle, Homer, Reesville, and Whitaker series.

Crosby soils have formed on loam to coarse-textured clay loam glacial till that in most places is highly calcareous at a depth of 25 inches. They are similar to the Miami soils but have a mottled B_1 horizon and a slightly higher content of clay in the B_2 horizon.

Fincastle soils have formed in loess that is 18 to 36 inches thick and overlies calcareous loam to coarse clay loam glacial till. In contrast to the Russell soils, the Fincastle soils have a mottled B_1 horizon. In most places they have a little more clay in the B_2 horizon than the Russell soils. Some areas of Fincastle soils are mapped with Crosby silt loam in undifferentiated soil groups. In these places the mantle of loess is thinner than in the Fincastle soils mapped separately, or 15 to 30 inches thick, and the soils are moderately gritty throughout. The underlying till is calcareous at depths of less than 42 inches.

Homer soil has formed in silty and loamy outwash that overlies calcareous sand and gravel. It is similar to the Fox soils, but the Homer soil is mottled from the B_1 horizon downward and it generally has a little more clay in the B_2 horizon. In places the underlying material contains a little more fine material than that underlying the Fox soils.

Reesville soils have formed in a layer of loess, 3 to 5 feet thick, that overlies calcareous loam to light clay loam glacial till of Wisconsin age. Generally, the loess is a fine silt and is dolomitic. Table 7 gives mechanical and chemical analyses of a sample of Reesville silt loam.

Whitaker soils have formed in stratified sandy loam and silt that is fairly low in carbonates. These soils are similar to the Martinsville soils but are mottled from the B_1 horizon downward.

Gray-Brown Podzolic Soils Intergrading to Red-Yellow Podzolic Soils

Cincinnati soils are well drained. They occur on the till plain in rolling areas that have been highly dissected

TABLE 7.—*Analytical data for Reesville silt loam (NW¼NE¼ sec. 1, T. 14 N., R. 13 E., Union County, Ind.)*

MECHANICAL ANALYSES

Horizon	Depth	Size class and diameter of particles (in mm.)							Other classes (in mm.)		
		Very coarse sand, 2.0–1.0	Coarse sand, 1.0–0.5	Medium sand, 0.5–0.25	Fine sand, 0.25–0.1	Very fine sand, 0.1–0.05	Silt, 0.05–0.002	Clay, <0.002	0.2–0.02	0.02–0.002	>2.0
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
A_p	0–6	1. 0	1. 9	1. 0	1. 0	1. 1	76. 4	17. 6	34. 0	44. 0	−1. 0
A_2	6–12	. 9	1. 8	1. 1	1. 1	1. 1	76. 4	17. 6	36. 5	41. 5	−1. 0
B_1	12–15	. 2	. 6	. 5	. 7	1. 0	64. 4	32. 6	27. 1	38. 7	−1. 0
B_2	15–22	. 1	. 5	. 4	. 6	1. 1	63. 4	33. 9	29. 1	35. 8	−1. 0
B_3	22–26	0	. 1	. 2	. 2	1. 0	69. 3	29. 2	40. 6	29. 7	0
C_1	26–35	. 1	. 2	. 3	. 6	2. 9	74. 4	21. 5	46. 4	31. 2	−1. 0
C_2	35–54	0	. 2	. 3	. 6	3. 5	82. 0	13. 4	50. 1	35. 7	2. 0
D_1	54–72	6. 4	8. 2	7. 3	12. 6	9. 0	39. 4	17. 1	33. 6	21. 7	18. 0

CHEMICAL ANALYSES

Horizon	Depth	pH	Exchangeable cations (meq./100 gm.)						Base saturation	Organic carbon
			Ca	Mg	H	Na	K	Sum of cations		
									Percent	*Percent*
A_p	0–6	6. 5	7. 6	2. 2	4. 8	−0. 1	0. 2	14. 8	68	1. 06
A_2	6–12	6. 5	7. 7	2. 3	4. 8	. 1	. 2	15. 1	68	1. 16
B_1	12–15	5. 6	10. 3	4. 6	6. 6	. 1	. 4	22. 0	70	. 48
B_2	15–22	5. 6	11. 2	5. 4	6. 6	. 2	. 4	23. 8	72	. 55
B_3	22–26	6. 2	10. 2	5. 8	4. 6	. 2	. 4	21. 2	78	. 33
C_1	26–35	7. 2	8. 5	4. 9	2. 3	. 1	. 2	16. 0	86	. 29
C_2	35–54	7. 9	[1]	----	----	----	----	----	----	. 16
D_1	54–72	8. 0	[1]	----	----	----	----	----	----	. 16

[1] Calcareous.

by streams. These soils have formed in loess that is 10 to 60 or more inches thick. The loess overlies loam to clay loam glacial till of Illinoian age. These soils are acid to the till, which is calcareous and lies at depths of 10 to 12 feet. The soils have a friable B horizon, underlain by an incipient fragipan. The fragipan consists of very compact, light-gray silt mottled with yellow and gray. It has vertical cracks that are topped and coated with silt.

Humic Gley Soils

Humic Gley soils are dark colored and have formed in low areas where drainage was poor much of the time. They have A horizons that are rich in organic matter. At depths of 12 to 22 inches, the A horizon grades to gleyed material that is gray or mottled with gray and yellow. This gleyed horizon has vertical cracks and fissures that are topped and coated with organic-mineral colloids.

The soils have formed under a swamp forest made up of water-tolerant trees, marsh grasses, and sedges. They are nearly neutral throughout. Soluble carbonates leach out with drainage, but the exchange complex remains highly charged with bases. The Brookston, Cope, Kokomo, Sloan, and Westland soils are in this group.

Brookston soils are very poorly drained. They have formed from highly calcareous glacial till that had a slight deposition of silt and clay washed from surrounding soils. The dark-gray, highly organic mineral layer is 12 to 16 inches deep. It grades to a fine, silty clay loam subsoil that is mottled with gray and yellow and is fairly compact. The profile is neutral to the till, which occurs at depths of 3 to 6 feet.

Cope soils are poorly drained. They are like the Brookston soils but are slightly acid and are not quite so dark colored. They have formed in small, shallow depressions in glacial till of Early Wisconsin age, near Russell, Fincastle, and Delmar soils.

Kokomo soil is very poorly drained to ponded. It has formed in deep depressions that were saturated much of the time. As a result, the soil is darker colored than the Brookston and Cope soils and is deeper. The A horizon is 14 to 20 inches or more thick. It grades through dark gray to a horizon that is lighter gray.

Sloan soil is very poorly drained. It occupies wet, seepy areas on flood plains. The soil receives small deposits of alluvium that somewhat modify the color and texture of the surface soil.

Westland soil is also very poorly drained. It occupies areas in former outwash channels. The soil has formed in stratified, glaciofluvial outwash and in valley train deposits. The deposits are made up mainly of silty and clayey materials. These materials overlie gravel and sand that is calcareous at depths of 42 to 60 inches or more. The texture in the lower part of the profile varies, but generally it contains enough gravel and sand to make the soil friable.

Planosols

Planosols have leached A horizons and strongly illuviated, cemented or compacted B horizons. They occur on nearly level uplands.

In this area the Planosols have formed under forest. The soils in this group are in the Avonburg and Delmar series.

Avonburg soils are somewhat poorly drained. They occupy small, nearly level areas on the Illinoian till plain. They have formed in loess, 3 to 6 feet thick, that overlies leached glacial till of Illinoian age. The till is loam to coarse-textured clay loam and is calcareous at depths of 10 to 14 feet. The soils have a weak textural B horizon that overlies a compact, very slowly permeable fragipan. The fragipan is at depths of 3 to 4 feet.

Delmar soil is poorly drained. It has formed in silt that is 18 to 40 inches thick. The silt overlies calcareous loam to coarse-textured clay loam glacial till of Wisconsin age. The textural B horizon of this soil is not so well developed as that of the Avonburg soils.

Brown Forest Soils

Brown Forest soils have very dark brown A horizons, rich in organic matter, and dark brown B horizons. They are neutral in reaction and have a moderately high amount of exchangeable calcium.

The soils of the Ninevah and Rodman series are in this group. They are well drained to excessively drained.

Nineveh soils have formed in loamy, stratified outwash and valley train materials that overlie calcareous gravel and sand. Depth to the calcareous material is generally about 30 inches but ranges from 24 to 42 inches. The Nineveh soils are similar to the Fox soils, but they are nearly neutral, are darker colored, and have a higher content of organic matter.

Rodman soils are on steep escarpments of alluvial terraces and on very steep slopes of kames and eskers of Wisconsin age. They have formed on stratified, loose, gray gravel and sand that is calcareous at depths of 12 to 18 inches. The soils have a very dark brown, neutral to slightly calcareous A horizon that directly overlies the parent material. They have weak horizonation, resembling that of the Regosols.

Regosols Intergrading to Gray-Brown Podzolic Soils

Regosols are made up of deep, unconsolidated or soft, rocky deposits in which no clearly expressed soil characteristics have developed.

There are no true Regosols in these counties. Although the Hennepin series is classified in this group, the soils are intergrading to Gray-Brown Podzolic soils because they have a weak textural B horizon.

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Hennepin soils are excessively drained. They have formed on highly calcareous loam to coarse-textured clay loam till of Wisconsin age. The steep soils commonly have a loam or silt loam A horizon and a loam to light clay loam B horizon that overlies loamy till at depths of 1 to 2 feet. The very steep soils have an A horizon, 12 inches thick, that is neutral in reaction and extends to the parent material.

In uncultivated areas the upper 1-inch layer of the A horizon is dark grayish brown. Depth to the C horizon, in these places, is somewhat greater than in eroded areas.

Rendzinas

The Rendzinas have a dark-brown surface layer that overlies pale yellowish-brown, limy material. Generally, they have fairly steep slopes and have formed under forest or under a mixed cover of grasses and forest. In these counties the Fairmount series is the only member of the Rendzina great soil group mapped. The Fairmount soils grade to Brown Forest soils.

Fairmount soils are excessively drained. They have steep slopes and occur in areas where geological erosion nearly balances soil development. The soils have formed from gray, soft, clay shale and flaggy limestone of the Ordovician period. The A horizon is very dark brown. In most places it grades to an olive-yellow, clayey subsoil that is neutral in reaction. Flaggy limestone occurs on the surface and throughout the solum. The depth to calcareous parent material ranges from 12 to 24 inches.

Alluvial Soils

Alluvial soils have formed from material recently deposited on flood plains. They have little or no profile development and receive fresh deposits during periods of overflow.

In this area the soils have formed in neutral to calcareous materials washed from timbered areas of glacial drift of Wisconsin age. They are light brown to dark brown in color. Drainage ranges from good to somewhat poor. The Genesee, Ross, Eel, and Shoals soils are in this group.

Genesee and *Ross* soils are well drained. The Genesee soils are brown in most places and have an A horizon less than 14 inches thick. In places where deposition is slight, however, the A horizon may be very dark brown. The Ross soils are very dark brown and have an A horizon that is 12 to 24 or more inches thick.

Other Alluvial soils are the Eel and Shoals. The Eel soils are moderately well drained, and the Shoals soils are somewhat poorly drained.

General Information About the Counties

The settlement of Fayette and Union Counties is discussed in the following section. A description of the climate, transportation and markets, and industries is also given.

Settlement

Fayette and Union Counties are part of an area originally claimed by the Miami Confederacy of Indiana. In 1795, the Greenville Treaty Line cut through the area. In 1803, the land to the east of the line was ceded to the United States under terms of the Old Boundary Line Treaty. It was then surveyed and offered for sale. The area west of the line was ceded to the United States as part of the 12-Mile Purchase under terms of a treaty signed at Fort Wayne in 1811.[5]

John Conner, one of the signers of the purchase document, was the first settler in Fayette County. In 1809, he opened a trading post at what is now Connersville. Soon other settlers arrived. Some cleared the woodlands so they could cultivate the land; others opened trading posts or began to operate gristmills, sawmills, or tanneries. In 1817, when the county was organized, it had a population of 3,000. It was the first county made up of part of the purchase territory. The county was named in honor of General Lafayette.

The first settlers in Union County were John Templeton and Joseph Hanna who settled along the East Fork of Whitewater River in 1804. Although the county was established in 1821, final boundaries were not decided until 1824 when two tiers of sections were added from Franklin County. The name Union was chosen for the county in the hope its organization would bring harmony between Fayette and Wayne Counties.

In pioneer days the population of both counties increased rapidly. Many industries were established in Fayette County, and the population continued to increase. In contrast, Union County remained mainly agricultural. Its population reached its peak around 1850 and has declined somewhat since then.

Transportation and Markets

The only roads the early settlers had were old Indian trails through the woods. The rivers and streams were crossed at shallow fords. Livestock had to be driven to market on foot.

An attempt was made to provide transportation by canal, and the first canal boat arrived at Connersville in 1845. Severe floods, however, destroyed much of the canal, and little use was made of it. The canal was soon sold at a heavy loss to the Whitewater Railroad for a right-of-way.

In 1862, the first railroad was completed as far as Connersville. In the late 1800's, many private toll roads were built; some, which were planked, were fairly good, but others were very poor. Each owner charged for his particular section of the road.

After the 1890's, public highways were improved. The present county and township highway system maintains good gravel and hard-surface roads in all parts of both counties; State highways crisscross the counties.

Now, four railroads serve Fayette County and three serve Union County. Agricultural and industrial products can be transported to markets easily, either by railroad or by motortrucks that operate over the highways. Passenger service is also provided.

[5] WEAKLEY, FRANK E. HISTORY OF UNION COUNTY, IND. 75 pp., illus., n.d.

Industries

The industries in the two counties are located mainly in Connersville in Fayette County, where factories employ about 4,000 workers. Among the articles manufactured are automobile parts, kitchen cabinets, refrigerators, heating equipment, caskets and burial vaults, tools, dies, metal stampings, glass replacements and mirrors, porcelain tanks and casings, and feed for livestock.

Climate

Fayette and Union Counties have a continental type of climate. There are erratic changes of temperature within and between seasons. The winters are moderately cold; the summers are fairly warm and humid. Table 8, compiled from records of the United States Weather Bureau at Rushville, in Rush County, Ind., gives normal, monthly, seasonal, and annual temperatures considered typical of those that prevail in Fayette and Union Counties.

The area has an average frost-free period of 155 days. The average date of the last killing frost in spring is May 3, and the average date of the first in autumn is October 5. On the uplands the frost-free period generally begins about a week earlier than on the lowlands and ends a week or more later. Consequently, the growing season may be somewhat longer on the uplands.

The rainfall is fairly uniform throughout the year, but it varies from season to season. The heaviest rains come in spring; they may cause erosion of upland soils and flooding of the lowlands. In some areas crops are damaged frequently by lack of moisture during July and August. Floods are a constant threat to crops on the bottom lands of the Whitewater River. Hail occasionally damages crops in small areas, but damage from tornadoes or lightning is slight. The least stormy season is fall.

Most of the snowfall takes place during the period from December through March, but the total snowfall generally is not great. The winter season is marked by rapid changes in temperature. Subzero temperatures sometimes last for 2 or 3 days but are followed by short periods of warm weather. The resulting freezing and thawing sometimes causes heaving of the soil and winterkilling of such crops as alfalfa, clover, and winter wheat. To prevent erosion during periods of thawing, it is necessary to keep a winter cover crop on the soils.

Agriculture

The agriculture in Fayette and Union Counties is based mainly on the raising of livestock, chiefly hogs. Although Fayette County is larger than Union County, a smaller acreage is suited to agriculture. The more outstanding features of the agriculture of the two counties are discussed in the following pages. The statistics used are from reports published by the United States Bureau of the Census.

TABLE 8.—*Temperature and precipitation* [1]

[At Rushville, Ind., lat. 39°36′ N., long. 85°27′ W., and elev. (ground) 955 feet. This station was at Mauzy, Ind., prior to 1948]

Month	Temperature (°F.)							Precipitation totals (inches)						
	Means			Extremes		Maximum 90° and above	Minimum 32° and below	Mean	Maximum in 24 hours	Maximum monthly	Minimum monthly	0.1 inch or more	0.5 inch or more	Mean snowfall
	Daily maximum	Daily minimum	Monthly	Highest	Lowest									
Record year [2]	*(67)*	*(67)*	*(67)*	*(75)*	*(75)*	*(7)*	*(7)*	*(77)*	*(71)*	*(77)*	*(77)*	*(3)*	*(7)*	*(61)*
January	37. 4	19. 9	28. 7	70	−26	0	28	3. 39	3. 67	12. 06	0. 71	6	2	7. 0
February	39. 0	20. 8	29. 9	71	−25	0	4	2. 83	2. 33	8. 31	. 32	8	2	5. 4
March	50. 1	29. 6	39. 9	86	−10	0	6	3. 96	5. 59	12. 08	. 04	7	2	4. 2
April	61. 4	39. 3	50. 4	89	14	0	1	3. 69	3. 41	9. 11	. 90	9	3	. 9
May	72. 8	49. 3	61. 6	96	26	(3)	0	4. 10	3. 23	8. 46	. 53	9	3	. 1
June	82. 1	58. 3	70. 2	101	35	6	0	3. 93	3. 24	8. 45	. 71	7	2	0
July	86. 6	61. 7	74. 2	108	40	9	0	3. 33	3. 38	7. 96	. 20	6	2	0
August	83. 5	59. 6	71. 6	103	36	6	0	3. 15	3. 55	9. 64	. 29	4	2	0
September	78. 9	53. 7	61. 3	101	22	5	0	3. 38	3. 73	9. 36	. 17	4	2	0
October	66. 6	42. 1	54. 4	90	12	(3)	4	2. 83	3. 99	9. 11	. 23	6	2	. 2
November	51. 1	31. 4	41. 3	83	−10	0	1. 9	3. 17	3. 05	9. 25	. 37	7	2	1. 9
December	39. 3	22. 7	31. 0	68	−21	0	23	2. 97	2. 30	6. 14	. 48	5	2	6. 0
Year	62. 3	40. 7	51. 5	108	−26	26	85	40. 73	5. 59	12. 08	. 04	78	25	25. 7

[1] Data for this table prepared by the State Climatologist.
[2] Number of years on which average is based; means and extremes recorded in the period 1881–1957.
[3] Less than one-half day.

Land Use

In 1954, 89.5 percent of the acreage in Fayette County and 91.9 percent of the acreage in Union County was in farms. The number of acres in farms and the acreage of farmland used for the different purposes are as follows:

	Fayette	*Union*
Approximate land in farms	123, 172	98, 862
Cropland (total)	83, 035	70, 395
Harvested	64, 249	56, 578
Used only for pasture	16, 548	12, 991
Not harvested or pastured	2, 238	826
Woodland (total)	21, 270	18, 311
Pastured	16, 968	13, 686
Not pastured	4, 302	4, 625
Land pastured (total)	44, 875	32, 016
Other land (houses, lots, roads, wasteland, and so on)	7, 526	4, 817

The average size of farms in Fayette County was 154.4 acres in 1954, and in Union County, 155.9 acres. In the same year there were 798 farms in Fayette County and 634 in Union County.

Crops

Corn and wheat are the main crops grown in the two counties. Meadow crops provide pasture for livestock, chiefly hogs. Most pastures consist of alfalfa, ladino and red clovers, and grass mixtures. Table 9 gives the acreage of the principal crops in the two counties for specified years.

TABLE 9.—*Acreage of the principal crops*

Crop	Fayette		Union	
	1949	1954	1949	1954
	Acres	*Acres*	*Acres*	*Acres*
Corn for all purposes	30, 715	29, 887	26, 668	27, 644
Soybeans for all purposes	2, 294	2, 332	922	676
Wheat threshed or combined	16, 695	11, 288	16, 508	11, 738
Oats threshed or combined	3, 984	7, 621	3, 450	5, 830
All hay	9, 093	11, 817	7, 342	9, 539

Livestock and Livestock Products

In 1954, 79.2 percent of the farm income in Fayette County and 82.9 percent of that in Union County came from livestock and livestock products. Of the livestock, hogs provided the most income. Union County ranked as one of the most important hog-producing counties in the State. The number of livestock on farms, by counties, was as follows in 1954:

	Fayette	*Union*
Horses and mules	372	169
Milk cows	2, 901	2, 853
Cattle and calves	15, 142	12, 565
Hogs and pigs	53, 726	61, 322
Sheep and lambs	3, 494	2, 976
Chickens	54, 334	48, 860

In Fayette County, 66,147 hogs and pigs were sold alive in 1954 in contrast to 83,022 sold in Union County. Also sold in Fayette County in 1954 were 32,826 chickens as compared to 27,442 chickens sold in Union County.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

[Colors of surface soil and subsoil are general; for the surface soil, colors are for cultivated areas

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
AvA	Avonburg silt loam, 0 to 2 percent slopes.	Uplands on the glacial till plain.	Loess, 30 to 50 inches thick, over loam to coarse-textured clay loam till of Illinoian age; limy at depths of 10 or more feet.	Dark grayish-brown to light brownish-gray silt loam.	Mottled gray, yellow, and pale-brown silty clay loam.
AvB2	Avonburg silt loam, 2 to 6 percent slopes, eroded.	Interstream divides	Same	Pale-brown silt loam	Same
BbA	Birkbeck silt loam, 0 to 2 percent slopes.	Slightly elevated areas on glacial till plains.	Neutral to limy loess, 3 to 5 feet thick, over calcareous loam to coarse-textured clay loam till of Wisconsin age.	Brown to pale-brown silt loam.	Yellowish-brown to pale yellowish-brown silty clay loam.
BbB1	Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
BbB2	Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
By	Brookston silty clay loam.	Upland swales and depressions.	Loam to coarse-textured clay loam till; highly calcareous at depths of 38 to 65 inches.	Very dark grayish-brown silty clay loam.	Yellowish-brown silty clay loam mottled with light grayish brown and gray.
Br	Brookston silt loam	Same	Same	Same	Same
CcB1	Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded.	Dissected ridgetops in uplands and on hillsides around deep valleys.	Silt, 10 to 60 inches thick, over loam to coarse-textured clay loam till of Illinoian age; highly calcareous at depths greater than 10 feet.	Brown to pale-brown silt loam.	Dark yellowish-brown to yellowish-brown silty clay loam.
CcB2	Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Brown	Same
CcC1	Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded.	Same	Same	Brown	Same
CcC2	Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded.	Same	Same	Brown	Same
CnC3	Cincinnati soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Brown	Same
CcD1	Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded.	Same	Same	Brown	Same
CcD2	Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded.	Same	Same	Brown	Same
CnD3	Cincinnati soils, 12 to 18 percent slopes, severely eroded.	Same	Same	Brown	Same
CcE1	Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded.	Same	Same	Brown	Same
CcE2	Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded.	Same	Same	Brown	Same
CnE3	Cincinnati soils, 18 to 25 percent slopes, severely eroded.	Same	Same	Brown	Same

SUMMARY OF IMPORTANT CHARACTERISTICS

or, if soil is forested, the range of colors for that layer is given. Acidity is for unlimed areas]

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Medium acid to strongly acid.	Strongly acid to very strongly acid.	Somewhat poor	Slow	Slow to very slow.	Slight	High	Low to medium.
Same	Same	Somewhat poor	Slow	Medium	Moderate	High	Low to medium.
Neutral to slightly acid.	Medium acid to strongly acid.	Moderately good.	Moderate	Slow	Slight	High	Medium to high.
Medium acid	Same	Moderately good.	Moderate	Medium to rapid.	Moderate	High	Medium to high.
Medium acid	Same	Moderately good.	Moderate	Medium to rapid.	Severe	Medium	Medium.
Slightly acid to neutral.	Neutral to mildly alkaline.	Very poor	Slow	Slow to ponded.	None	Very high	High.
Same	Same	Very poor	Slow	Slow to ponded.	None	Very high	High.
Medium acid to strongly acid.	Medium acid to strongly acid.	Good	Moderate	Medium	Medium	Medium to high.	Medium to low.
Same	Same	Good	Moderate	Medium to rapid.	Severe	Medium to high.	Medium to low.
Same	Same	Good	Moderate	Rapid	Severe	Medium to high.	Medium to low.
Same	Same	Good	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Good	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Good to excessive.	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
CcF2	Cincinnati silt loam, 25 to 45 percent slopes, eroded.	Same	Same	Brown	Same
Cp	Cope silty clay loam	Shallow swales and depressions in uplands.	Loam to coarse-textured clay loam glacial till; highly calcareous at depths of 4 to 6 feet.	Very dark grayish-brown to very dark gray silty clay loam.	Mottled gray, yellow, and brown silty clay loam.
Co	Cope silt loam	Same	Same	Dark gray to very dark gray silt loam.	Same
CrA	Crosby silt loam, 0 to 2 percent slopes.	Uplands on the glacial till plain.	Loam to coarse-textured clay loam glacial till; highly calcareous at depths of 12 to 40 inches.	Grayish-brown silt loam.	Mottled gray and yellowish-brown silty clay loam.
CrB1	Crosby silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Same
CrB2	Crosby silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
De	Delmar silt loam	Nearly level areas or depressions in uplands.	Silt, 18 to 36 inches thick, over loam to clay loam till; calcareous at depths of 42 to 70 or more inches.	Light-gray to gray, smooth silt loam.	Light-gray silty clay loam, mottled with yellowish brown.
Es	Eel silt loam	Bottom lands along small streams; shallow swales and meander channels of larger streams.	Neutral to calcareous alluvium washed from areas of forested glacial drift of Wisconsin age.	Brown to dark grayish-brown silt loam.	Brown to dark grayish-brown silt loam.
Ee	Eel loam	Same	Same	Grayish-brown loam	Same
FaB	Fairmount silty clay loam, 2 to 6 percent slopes.	Slopes, knolls, and hillsides in uplands.	Calcareous clay shale and flaggy limestone of Ordovician and Silurian periods.	Very dark gray silty clay loam.	Dark yellowish-brown silty clay loam.
FaC	Fairmount silty clay loam, 6 to 12 percent slopes.	Same	Same	Very dark grayish-brown fine silty clay loam.	Same
FaD	Fairmount silty clay loam, 12 to 18 percent slopes.	Same	Same	Same	Same
FaE	Fairmount silty clay loam, 18 to 25 percent slopes.	Same	Same	Same	Same
FaF	Fairmount silty clay loam, 25 to 35 percent slopes.	Same	Same	Same	Same
FaG	Fairmount silty clay loam, 35 to 50 percent slopes.	Same	Same	Same	Same
FcA	Fincastle silt loam, 0 to 2 percent slopes.	Uplands on the glacial till plain.	Loess, 18 to 40 inches thick, over loam to clay loam glacial till of Early Wisconsin age; limy at depths of 42 to 70 inches.	Pale-brown to grayish-brown silt loam.	Mottled pale-brown and yellowish-brown silty clay loam.
FcB1	Fincastle silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Grayish-brown to light brownish-gray silt loam.	Mottled very pale brown and dark yellowish-brown silty clay loam.
FcB2	Fincastle silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Same	Same	Same	Moderate	Very rapid	Very severe	Medium to high.	Low.
Neutral	Neutral to mildly alkaline.	Poor to very poor.	Slow	Very slow to ponded.	None	Very high	High.
Neutral	Same	Poor to very poor.	Slow	Very slow	None	Very high	High.
Slightly acid to medium acid.	Medium acid to slightly acid.	Somewhat poor	Slow	Slow	Slight	High	Medium to high.
Same	Same	Somewhat poor	Slow	Medium to slow.	Slight to moderate.	High	Medium.
Same	Same	Somewhat poor	Slow	Medium	Moderate	Medium	Medium.
Medium acid to strongly acid.	Medium acid to strongly acid.	Poor	Slow to very slow.	Very slow	None	Medium to high.	Medium.
Neutral to calcareous.	Calcareous	Moderately good.	Moderate	Slow to ponded.	Slight to moderate.	Very high	High.
Same	Calcareous	Moderately good.	Moderate	Slow to ponded.	Same	Medium to high.	High.
Neutral	Neutral	Good	Moderately slow.	Rapid	Severe	High	Medium.
Neutral	Neutral	Good	Same	Very rapid	Very severe	Medium	Medium to low.
Neutral	Neutral	Good to excessive.	Same	Very rapid	Very severe	Low	Medium.
Neutral	Neutral	Same	Same	Very rapid	Very severe	Low	Low.
Neutral	Neutral	Same	Same	Very rapid	Very severe	Low	Low.
Neutral	Neutral	Same	Same	Very rapid	Very severe	Low	Low.
Medium to slightly acid.	Strongly acid to medium acid.	Somewhat poor	Slow	Slow	Slight	High	Medium to high.
Slightly acid	Medium acid to strongly acid.	Somewhat poor	Slow	Medium to slow.	Slight to moderate.	High	Medium to high.
Slightly acid	Same	Somewhat poor	Slow	Medium	Moderate	High	Medium.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
FeA	Fincastle and Crosby silt loams, 0 to 2 percent slopes.	Same	Loess, 15 to 30 inches thick, over loam to clay loam glacial till of Early Wisconsin age; calcareous at depths of 24 to 42 inches.	Same	Mottled pale-brown and yellowish-brown silty clay loam.
FeB	Fincastle and Crosby silt loams, 2 to 6 percent slopes.	Same	Same	Same	Mottled very pale brown and dark yellowish-brown silty clay loam.
FeB2	Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded.	Same	Same	Same	Same
FmA	Fox loam, 0 to 2 percent slopes.	Low stream terraces, generally at elevations 5 to 10 feet above the bottom lands.	Silty or loamy overburden, 12 to 18 inches thick, over gravel and sand of Wisconsin age; highly calcareous at depths of 24 to 42 inches.	Brown to dark-brown loam.	Brown to reddish-brown clay loam.
FmB1	Fox loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Brown to dark-brown loam.	Same
FmB2	Fox loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Brown to dark-brown loam.	Same
FmC2	Fox loam, 6 to 12 percent slopes, moderately eroded.	Sloping areas bordering streams and kettle holes.	Same	Brown to dark-brown loam.	Same
FnA	Fox silt loam, 0 to 2 percent slopes.	Low stream terraces, generally at elevations 5 to 10 feet above the bottom lands.	Same	Brown to grayish-brown silt loam.	Brown to reddish-brown silty clay loam to gravelly clay loam.
FnB1	Fox silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
FnB2	Fox silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
FnC2	Fox silt loam, 6 to 12 percent slopes, moderately eroded.	Short slopes on terrace escarpments.	Same	Same	Same
FpC3	Fox soils, 6 to 12 percent slopes, severely eroded.	Breaks of the higher terraces.	Same	Yellowish-brown to brown, heavy loam or clay loam.	Brown to reddish-brown clay loam.
FnD1	Fox silt loam, 12 to 18 percent slopes, slightly eroded.	Same	Same	Brown to grayish-brown silt loam.	Brown to reddish-brown silty clay loam to gravelly clay loam.
FnD2	Fox silt loam, 12 to 18 percent slopes, moderately eroded.	Sloping areas bordering streams and kettle holes.	Same	Same	Same
FoB2	Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded.	Moderate slopes of kames and eskers.	Same	Same	Brown gravelly loam to loose gravel and sand.
FoC2	Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded.	Sloping areas bordering streams and kettle holes.	Same	Same	Same
FrC3	Fox soils, kames, 6 to 12 percent slopes, severely eroded.	Same	Same	Brown to grayish-brown silt loam to loam.	Same
FtD2	Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded.	Strongly sloping terraces.	Same	Brown to dark-brown loam to yellowish-brown clay loam.	Same
FtE2	Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded.	Steep slopes of kames and eskers.	Same	Same	Same

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Slightly acid	Same	Somewhat poor	Slow	Slow	Slight	High	Medium to high.
Slightly acid	Same	Somewhat poor	Slow	Medium to slow.	Slight to moderate.	High	Medium to high.
Slightly acid	Same	Somewhat poor	Slow	Medium	Moderate	High	Medium.
Slightly acid to medium acid.	Medium acid to slightly acid.	Good to somewhat excessive.	Moderately rapid.	Slow	Slight	Medium to low.	Medium to high.
Same	Same	Same	Same	Medium	Moderate	Medium to low.	Medium to high.
Same	Same	Same	Same	Medium	Moderate	Medium to low.	Medium.
Same	Same	Excessive	Moderately rapid.	Rapid	Severe	Low	Low.
Medium acid	Medium acid	Good to excessive.	Moderate	Very slow	Slight	Medium	Medium.
Medium acid	Medium acid	Same	Same	Medium	Moderate	Medium	Medium.
Medium acid	Medium acid	Same	Same	Medium	Moderate to severe.	Medium to low.	Low to medium.
Medium acid	Medium acid	Same	Same	Rapid	Severe	Low	Low.
Slightly acid to medium acid.	Medium acid to slightly acid.	Excessive	Moderately rapid.	Rapid	Severe	Low	Low.
Medium acid	Medium acid	Good to excessive.	Moderate to moderately rapid.	Rapid	Severe	Low	Low.
Medium acid	Medium acid	Same	Same	Rapid	Severe	Low	Low.
Medium acid to slightly acid.	Medium acid	Same	Moderately rapid.	Medium	Severe	Medium to low.	Medium.
Same	Medium acid	Excessive	Same	Rapid	Severe	Medium to low.	Low.
Same	Medium acid	Excessive	Same	Rapid	Severe	Low	Low.
Neutral to alkaline	Medium acid to alkaline.	Excessive	Moderately rapid to rapid.	Rapid	Severe	Low to very low.	Low.
Same	Alkaline	Excessive	Rapid to very rapid.	Very rapid	Severe	Very low	Low.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
FxD3	Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded.	Same	Same	Grayish-brown loam to yellowish-brown gravelly clay loam.	Brown to reddish-brown clay loam.
FsD2	Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded.	Same	Same	Brown to dark-brown loam to yellowish-brown clay loam.	Brown gravelly loam to loose gravel and sand.
FvD3	Fox and Rodman soils, 12 to 18 percent slopes, severely eroded.	Same	Same	Grayish-brown loam to yellowish-brown gravelly clay loam.	Same
Gs	Genesee silt loam	Flood plains of the large and small streams.	Neutral to calcareous, silty to sandy alluvium washed from forested areas of glacial drift.	Brown to dark-brown silt loam.	Very dark yellowish-brown silt loam.
Gt	Genesee silt loam, high bottom.	Slightly elevated high bottoms of the larger streams.	Same	Same	Very dark yellowish-brown, heavy silt loam.
Gm	Genesee loam	Nearly level natural levees.	Same	Brown to dark-brown loam.	Very dark yellowish-brown loam.
Go	Genesee loam, high bottom.	Slightly elevated high bottoms of the larger streams.	Same	Brown to dark-brown loam.	Same
Gg	Genesee gravelly loam	Nearly level natural levees and on washout deposits along streams in the bottom lands.	Same	Yellowish-brown to brown gravelly loam.	Very dark yellowish-brown gravelly loam.
Ge	Genesee fine sandy loam.	Slight rises, or natural levees, along streams.	Neutral to slightly alkaline, silty to sandy alluvium washed from forested areas of glacial drift.	Yellowish-brown to brown fine sandy loam.	Very dark yellowish-brown, heavy fine sandy loam.
HeF1	Hennepin loam, 25 to 35 percent slopes, slightly eroded.	Slopes bordering deeply entrenched streams.	Highly calcareous loam to coarse-textured clay loam glacial till.	Dark grayish-brown to pale-brown loam to silt loam.	Pale-brown to yellowish-brown loam to light clay loam.
HeF2	Hennepin loam, 25 to 35 percent slopes, moderately eroded.	Same	Same	Same	Same
HeG1	Hennepin loam, 35 to 50 percent slopes, slightly eroded.	Same	Same	Same	Same
HeG2	Hennepin loam, 35 to 50 percent slopes, moderately eroded.	Same	Same	Same	Same
Ho	Homer silt loam	Level to slightly depressed areas on terraces.	Loamy and silty outwash over stratified gravel and sand, calcareous at depths of 36 to 46 inches.	Grayish-brown silt loam.	Pale-brown to dark-gray silty clay loam mottled with dark yellowish brown and brownish yellow.
Ko	Kokomo silty clay loam.	Deeper depressions, intermittent ponds, and kettle holes in uplands.	Highly calcareous loam to coarse-textured clay loam glacial till.	Very dark gray to black silty clay loam.	Gray heavy silty clay loam to light silty clay.
MbA	Manlove silt loam, 0 to 2 percent slopes.	Areas around drainageways in the uplands.	Loess, 3 to about 5 feet thick, over highly calcareous glacial loam till.	Light yellowish-brown, smooth silt loam.	Yellowish-brown to dark yellowish-brown, smooth, heavy silt loam to silty clay loam.
MbB1	Manlove silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
MbB2	Manlove silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
McA	Martinsville silt loam, 0 to 2 percent slopes.	Low alluvial terraces along old glacial melt water streams.	Calcareous, stratified sand and silt.	Dark grayish-brown to light yellowish-brown silt loam.	Light yellowish-brown to brownish-yellow silty clay loam to yellowish-brown sandy loam.

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Medium to slightly acid.	Medium acid	Excessive	Moderately rapid.	Rapid	Very severe	Very low	Low.
Neutral to alkaline.	Medium acid to alkaline.	Excessive	Moderately rapid to rapid.	Rapid	Severe	Low to very low.	Very low.
Same	Same	Excessive	Same	Rapid	Very severe	Low to very low.	Low.
Neutral to slightly calcareous.	Calcareous	Good	Moderate	Very slow	Slight	High to very high.	High.
Same	Neutral to slightly acid.	Good	Moderate	Slow	None	Very high	High.
Same	Calcareous	Good	Moderate	Slow	None	High	High.
Same	Calcareous	Good	Moderate	Slow	None	High	High.
Same	Calcareous	Good	Moderate to rapid.	Slow	None	Medium	Medium.
Mildly alkaline to calcareous.	Calcareous	Good	Moderately rapid.	Slow	None	Medium	Medium.
Slightly acid to neutral.	Neutral to mildly alkaline.	Excessive	Moderate	Very rapid	Very severe	Low	Low.
Same	Same	Excessive	Moderate	Very rapid	Very severe	Low	Low.
Same	Same	Excessive	Moderate	Very rapid	Very severe	Low	Low.
Same	Same	Excessive	Moderate	Very rapid	Very severe	Low	Low.
Slightly acid to medium acid.	Medium acid to neutral.	Somewhat poor	Slow	Slow	Slight	Medium	Medium.
Neutral	Neutral to mildly alkaline.	Very poor	Very slow	Very slow to ponded.	None	Very high	High.
Slightly acid to medium acid.	Medium acid to strongly acid.	Good	Moderate	Slow	Slight	Medium to high.	High.
Same	Same	Good	Moderate	Slow	Slight	Medium to high.	High.
Same	Same	Good	Moderate	Medium to rapid.	Moderate to severe.	Medium to high.	Medium
Same	Strongly acid to slightly acid.	Good	Moderate	Slow	Slight	Medium to high.	High.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
McB1	Martinsville silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
McB2	Martinsville silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
McC2	Martinsville silt loam, 6 to 12 percent slopes, moderately eroded.	Same	Same	Same	Same
McD2	Martinsville silt loam, 12 to 18 percent slopes, moderately eroded.	Same	Same	Same	Same
MmA	Miami silt loam, 0 to 2 percent slopes.	Knolls and ridges on till plains and slopes along drainageways.	Loam to coarse-textured clay loam till of Late Wisconsin age; highly calcareous at depths of 13 to 42 inches.	Brown to grayish-brown silt loam.	Brown silt loam to silty clay loam.
MmB1	Miami silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
MmB2	Miami silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Brown to yellowish-brown silt loam to silty clay loam.
MmC1	Miami silt loam, 6 to 12 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Yellowish-brown to brownish-yellow silt loam to silty clay loam.
MmC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
MmD1	Miami silt loam, 12 to 18 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Same
MmD2	Miami silt loam, 12 to 18 percent slopes, moderately eroded.	Same	Same	Grayish-brown to brownish-yellow, heavy silt loam to light silty clay loam.	Same
MmE1	Miami silt loam, 18 to 25 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Same
MmE2	Miami silt loam, 18 to 25 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
MsB3	Miami soils, 2 to 6 percent slopes, severely eroded.	Same	Same	Grayish-brown silt loam and yellowish-brown silty clay loam.	Same
MsC3	Miami soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Grayish-brown silt loam.	Same
MsD3	Miami soils, 12 to 18 percent slopes, severely eroded.	Same	Same	Grayish-brown to brownish-yellow, heavy silt loam to light silty clay loam.	Same
MsE3	Miami soils, 18 to 25 percent slopes, severely eroded.	Same	Same	Grayish-brown silt loam.	Same
MtB1	Milton silt loam, 2 to 6 percent slopes, slightly eroded.	Rock terraces, slightly higher than the flood plain.	Glacial drift, 18 to 42 inches thick, over limestone bedrock.	Brown silt loam	Yellowish-brown clay loam to dark yellowish-brown silty clay loam.
MtB2	Milton silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Brown silt loam	Same
Nn	Nineveh loam	Low alluvial terraces	Loamy outwash, over calcareous, stratified gravel and sand.	Very dark yellowish-brown to very dark grayish-brown loam.	Brown clay loam to reddish-brown gravelly clay loam.

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Same	Same	Good	Moderate	Medium	Moderate to slight.	High	Medium to high.
Same	Same	Good	Moderate	Medium	Moderate	Medium	Medium.
Same	Same	Good to excessive.	Moderate	Medium to rapid.	Moderate to severe.	Medium to low.	Medium to low.
Same	Same	Same	Moderate	Rapid	Same	Medium to low.	Medium to low.
Medium acid	Same	Good	Moderate	Slow	Slight	High	High.
Medium acid	Same	Good	Moderate	Slow to medium.	Moderate	High to medium.	High to medium.
Medium acid	Same	Good	Moderate	Medium to rapid.	Moderate to severe.	Medium	Medium.
Medium acid	Same	Good	Moderate	Medium to rapid.	Severe	Medium	Medium to low.
Medium acid	Same	Good	Moderate	Rapid	Severe	Medium	Medium to low.
Medium acid	Same	Good to excessive.	Moderate	Very rapid	Very severe	Medium to low.	Low.
Medium acid	Same	Same	Moderate	Very rapid	Very severe	Medium to low.	Low.
Medium acid	Same	Same	Moderate	Very rapid	Very severe	Medium to low.	Low.
Medium acid	Same	Same	Moderate	Very rapid	Very severe	Medium to low.	Low.
Medium acid	Same	Good	Moderate	Medium to rapid.	Moderate to severe.	Low	Medium.
Medium acid	Same	Good	Moderate	Very rapid	Very severe	Low	Low.
Medium acid	Same	Good to excessive.	Moderate	Very rapid	Very severe	Medium to low.	Low.
Medium acid	Same	Same	Moderate	Very rapid	Very severe	Medium to low.	Low.
Slightly acid	Slightly acid to to neutral.	Good	Moderate	Slow	Slight to moderate.	Medium	Medium.
Slightly acid	Same	Good	Moderate	Medium to rapid.	Moderate	Medium	Low.
Neutral	Neutral to calcareous.	Good to excessive.	Moderate to rapid.	Slow	Slight	Medium to low.	Medium to low.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
OcA	Ockley silt loam, 0 to 2 percent slopes.	High alluvial terraces	Silty and loamy material, about 3 feet thick, over stratified gravel and sand; calcareous at depths of 3½ feet or more.	Dark yellowish-brown to brown silt loam.	Yellowish-brown to reddish-brown silty clay loam.
OcB1	Ockley silt loam, 2 to 6 percent slopes, slightly eroded.	Gently sloping areas around drainageways and kettle holes.	Same	Same	Same
OcB2	Ockley silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Brown to yellowish-brown, heavy silt loam.	Same
OkB3	Ockley soils, 2 to 6 percent slopes, severely eroded.	Same	Same	Same	Same
OcC2	Ockley silt loam, 6 to 12 percent slopes, moderately eroded.	Terrace breaks or on escarpments along streams.	Same	Same	Same
OkC3	Ockley soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Grayish-brown, heavy loam to yellowish-brown clay loam.	Same
ReA	Reesville silt loam, 0 to 2 percent slopes.	Upland glacial till plains.	Loess, 3 to 5 feet or more thick, over limy, glacial till of Wisconsin age.	Brown to grayish-brown, smooth silt loam.	Mottled gray and yellowish-brown silty clay loam.
ReA2	Reesville silt loam, 0 to 2 percent slopes, moderately eroded.	Upland glacial till plains.	Same	Same	Same
ReB2	Reesville silt loam, 2 to 6 percent slopes, moderately eroded.	Upland glacial till plains.	Same	Same	Same
RgD2	Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded.	Slopes of terraces, kames, and eskers.	Stratified, calcareous gravel and sand.	Very dark grayish-brown to dark-brown gravelly loam.	Yellowish-brown, loose gravel and sand.
RgE1	Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded.	Same	Same	Same	Same
RgE2	Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded.	Same	Same	Same	Same
RgF2	Rodman gravelly loam, 25 to 50 percent slopes, eroded.	Same	Same	Same	Same
Ro	Ross silt loam	Infrequently flooded high bottoms.	Alluvium washed from areas of glacial drift of Wisconsin age.	Very dark brown silt loam to very dark grayish-brown silt loam.	Dark grayish-brown to yellowish-brown, heavy silt loam.
RsA	Russell silt loam, 0 to 2 percent slopes.	Uplands on the glacial till plains.	Loess, 18 to 40 inches thick, over clay loam glacial till of Early Wisconsin age, calcareous at depths of 42 to about 70 inches.	Dark grayish-brown to grayish-brown silt loam.	Yellowish-brown to brownish-yellow silty clay loam.
RsB1	Russell silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
RsB2	Russell silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
RtB3	Russell soils, 2 to 6 percent slopes, severely eroded.	Same	Same	Light yellowish-brown silt loam to brownish-yellow silty clay loam.	Same
RsC1	Russell silt loam, 6 to 12 percent slopes, slightly eroded.	Same	Same	Dark grayish-brown to grayish-brown silt loam.	Same

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Medium acid	Strongly acid to slightly acid.	Good	Same	Slow	Slight	Medium to high.	Medium to high.
Medium acid	Same	Good	Same	Medium	Moderate	Medium	Medium to high.
Medium acid	Same	Good	Same	Medium	Moderate	Medium	Medium.
Medium acid	Same	Good to excessive.	Same	Medium	Moderate	Medium	Low.
Medium acid	Same	Same	Same	Rapid	Severe	Medium	Low.
Medium acid	Same	Same	Same	Rapid	Severe	Low	Low.
Medium acid to slightly acid.	Strongly acid to neutral.	Somewhat poor	Slow	Slow	Slight	High	Medium to high.
Same	Same	Somewhat poor	Slow	Slow	Slight	High	Medium to high.
Same	Same	Somewhat poor	Moderate to slow.	Medium	Moderate	Medium	Medium.
Very slightly acid to slightly calcareous.	Calcareous	Excessive	Very rapid	Medium to rapid.	Moderate	Very low	Low.
Same	Calcareous	Excessive	Very rapid	Medium to rapid.	Moderate	Very low	Low.
Same	Calcareous	Excessive	Very rapid	Medium to rapid.	Moderate	Very low	Low.
Same	Calcareous	Excessive	Very rapid	Medium to rapid.	Moderate	Very low	Low.
Neutral	Neutral	Good	Moderate	Slow	None	High	High.
Medium acid to slightly acid.	Medium acid to strongly acid.	Good	Moderate	Medium	Slight	Medium to high.	Medium to high.
Same	Same	Good	Moderate	Medium	Moderate	Medium to high.	Medium to high.
Same	Same	Good	Moderate	Medium	Moderate to severe.	Medium to high.	Medium.
Same	Same	Good	Moderate	Medium	Severe	Medium	Medium to low.
Same	Same	Good	Moderate	Rapid	Severe	Medium	Medium.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
RsC2	Russell silt loam, 6 to 12 percent slopes, moderately eroded.	Same	Same	Same	Same
RtC3	Russell soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Light yellowish-brown silt loam to brownish-yellow silty clay loam.	Same
RsD1	Russell silt loam, 12 to 18 percent slopes, slightly eroded.	Same	Same	Dark grayish-brown to grayish-brown silt loam.	Same
RsD2	Russell silt loam, 12 to 18 percent slopes, moderately eroded.	Same	Same	Same	Same
RtD3	Russell soils, 12 to 18 percent slopes, severely eroded.	Same	Same	Light yellowish-brown silt loam to brownish-yellow silty clay loam.	Same
RsE1	Russell silt loam, 18 to 25 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Same
RsE2	Russell silt loam, 18 to 25 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
RtE3	Russell soils, 18 to 25 percent slopes, severely eroded.	Same	Same	Light yellowish-brown silt loam to brownish-yellow silty clay loam.	Same
RuA	Russell and Miami silt loams, 0 to 2 percent slopes.	Same	Loess, 15 to 30 inches thick, over loam or coarse-textured clay loam glacial till of Early Wisconsin age; calcareous at depths of 30 to 34 inches.	Grayish-brown, smooth silt loam.	Brown to yellowish-brown, friable silty clay loam.
RuB1	Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
RuB2	Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
RvB3	Russell and Miami soils, 2 to 6 percent slopes, severely eroded.	Same	Same	Grayish-brown, smooth silt loam and yellowish-brown silty clay loam.	Same
RuC1	Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded.	Same	Same	Grayish-brown silt loam.	Same
RuC2	Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded.	Same	Same	Grayish-brown silt loam.	Same
RvC3	Russell and Miami soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Grayish-brown to yellowish-brown silt loam to silty clay loam.	Same
Sh	Shoals silt loam	Swales and bayous near the larger streams.	Neutral to calcareous alluvium washed from timbered areas of glacial drift of Wisconsin age.	Grayish-brown silt loam.	Mottled gray, yellow, and brown silt loam to silty clay loam.
Sn	Sloan silt loam	Swales and seepage areas.	Same	Very dark grayish-brown to very dark brown silt loam.	Dark grayish-brown silty clay loam mottled with yellowish brown.
We	Westland silt loam	Swales and former meander channels.	Loamy and silty outwash, 42 to about 60 inches thick, over stratified, calcareous gravel and sand.	Very dark grayish-brown silt loam.	Mottled gray and yellowish-brown silty clay loam to clay loam.

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Same	Same	Good	Moderate	Rapid	Severe	Medium	Medium.
Same	Same	Good	Moderate	Rapid	Severe	Medium to low.	Low.
Same	Same	Good	Moderate	Rapid	Severe	Medium to low.	Low.
Same	Same	Good	Moderate	Rapid	Severe	Medium to low.	Low.
Same	Same	Good	Moderate	Rapid	Severe	Medium to low.	Low.
Same	Same	Good	Moderate	Rapid to very rapid.	Severe	Low	Low.
Same	Same	Good	Moderate	Same	Severe	Low	Low.
Same	Same	Good	Moderate	Same	Severe	Low	Low.
Same	Same	Good	Moderate	Slow	Slight	Medium to high.	Medium to high.
Same	Same	Good	Moderate	Slow	Moderate	Medium to high.	Medium to high.
Same	Same	Good	Moderate	Slow	Moderate	Medium to high.	Medium to high.
Same	Same	Good	Moderate	Medium	Severe	Medium	Medium.
Same	Same	Good	Moderate	Rapid	Moderate	Medium	Medium.
Same	Same	Good	Moderate	Rapid	Moderate	Medium	Medium.
Same	Same	Good	Moderate	Rapid	Severe	Medium	Low.
Neutral to alkaline.	Neutral to calcareous.	Somewhat poor	Slow	Very slow	None	High	Medium to high if drained.
Neutral to mildly alkaline.	Neutral	Very poor	Slow	Very slow to ponded.	None	Very high	High if drained.
Neutral to slightly acid.	Slightly acid to neutral.	Poor to very poor.	Slow	Same	None	Very high	High.

SOILS OF FAYETTE AND UNION COUNTIES, INDIANA:

Map symbol	Soil	Topography	Parent or underlying material	Surface soil	Subsoil
WhA	Whitaker silt loam, 0 to 2 percent slopes.	Outwash terraces	Stratified, calcareous silt and sand.	Grayish-brown to light brownish-gray, friable silt loam.	Mottled gray, pale-yellow, and brown silty clay loam to sandy clay loam.
WhB	Whitaker silt loam, 2 to 6 percent slopes.	Outwash terraces	Same	Same	Same
WnB1	Wynn silt loam, 2 to 6 percent slopes, slightly eroded.	Uplands on the glacial till plain.	Thin layer of loess over Wisconsin till that is generally leached and overlies limestone at depths of 40 to 60 inches; in places there is a thin layer of material from weathered limestone.	Dark-brown to brown, friable silt loam.	Brown silty clay loam to silty clay.
WnB2	Wynn silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
WnC2	Wynn silt loam, 6 to 12 percent slopes, moderately eroded.	Same	Same	Same	Same
WnD2	Wynn silt loam, 12 to 25 percent slopes, moderately eroded.	Same	Same	Grayish-brown silty clay loam.	Same
WyC3	Wynn soils, 6 to 12 percent slopes, severely eroded.	Same	Same	Brownish-yellow or brown silty clay loam.	Same
XeA	Xenia silt loam, 0 to 2 percent slopes.	Same	Loess, 18 to 40 inches thick, over loam to coarse-textured clay loam glacial till of Early Wisconsin age; calcareous at depths of 42 to 70 inches.	Dark grayish-brown to yellowish-brown, smooth silt loam.	Light yellowish-brown silty clay loam.
XeB1	Xenia silt loam, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
XeB2	Xenia silt loam, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same
XnA	Xenia and Celina silt loams, 0 to 2 percent slopes.	Same	Loess, 15 to 30 inches thick, over loam to coarse-textured clay loam glacial till of Early Wisconsin age; limy at depths of 24 to 42 inches.	Same	Same
XnB1	Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded.	Same	Same	Same	Same
XnB2	Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded.	Same	Same	Same	Same

SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Acidity		Natural soil drainage	Permeability	Runoff	Susceptibility to erosion	Moisture-supplying capacity	General productivity
Surface soil	Subsoil						
Neutral to strongly acid.	Strongly acid to neutral.	Somewhat poor	Moderate to slow.	Slow	Slight	Medium to high.	Medium to high.
Same	Same	Somewhat poor	Same	Medium	Moderate	Medium to high.	Medium to high.
Medium acid	Medium acid to strongly acid.	Good	Moderate	Medium	Moderate	High	Medium to high.
Medium acid	Same	Good	Moderate	Medium to rapid.	Moderate	High	Medium.
Medium acid	Same	Good	Moderate	Rapid	Moderate to severe.	Medium to high.	Medium to low.
Medium acid	Same	Good	Moderate	Rapid	Severe	Medium	Low.
Medium acid	Same	Good	Moderate	Rapid	Severe	Medium	Medium to low.
Medium acid to strongly acid.	Strongly acid to very strongly acid.	Moderately good	Moderate	Slight	Slight	Medium	Medium to high.
Same	Same	Moderately good	Moderate	Medium	Moderate	Medium	Medium to high.
Same	Same	Moderately good	Moderate	Medium to rapid.	Moderate to severe.	Medium	Medium.
Same	Same	Moderately good	Moderate	Slight	Slight	High	Medium to high.
Same	Same	Moderately good	Moderate	Medium	Moderate	High	Medium to high.
Same	Same	Moderately good	Moderate	Medium	Moderate	Medium	Medium.

GUIDE TO MAPPING UNITS

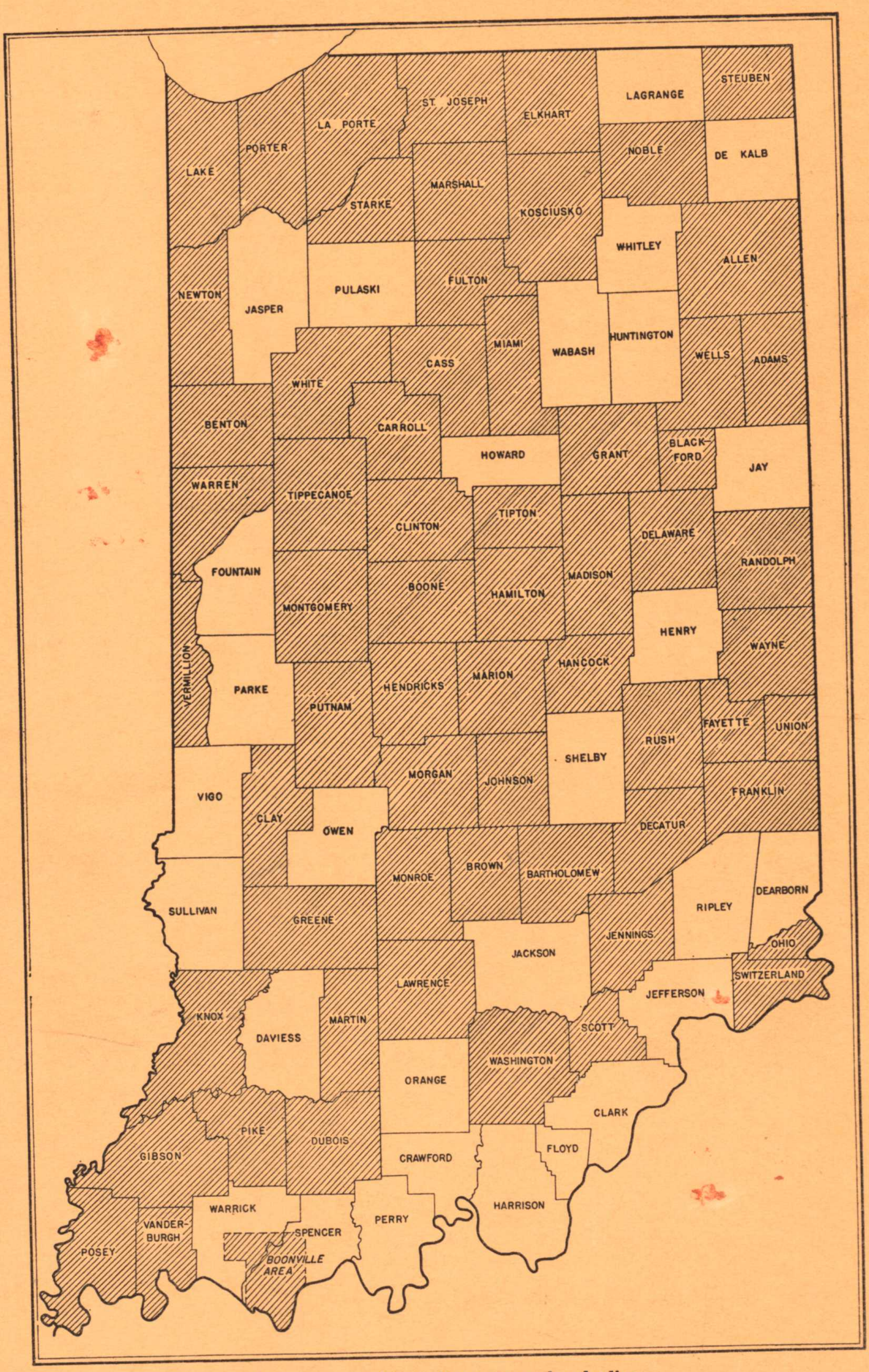
Map symbol	Soil	Page	Management group [1]	Capability class and subclass [1]
AvA	Avonburg silt loam, 0 to 2 percent slopes	30	5C	IIw
AvB2	Avonburg silt loam, 2 to 6 percent slopes, eroded	30	5D	IIw
BbA	Birkbeck silt loam, 0 to 2 percent slopes	31	1A	I
BbB1	Birkbeck silt loam, 2 to 6 percent slopes, slightly eroded	31	1B	IIe
BbB2	Birkbeck silt loam, 2 to 6 percent slopes, moderately eroded	31	1C	IIe
Bp	Borrow pits [2]	31		
Br	Brookston silt loam	32	6A	IIw
By	Brookston silty clay loam	31	6A	IIw
CcB1	Cincinnati silt loam, 2 to 6 percent slopes, slightly eroded	33	2A	IIe
CcB2	Cincinnati silt loam, 2 to 6 percent slopes, moderately eroded	33	2B	IIe
CcC1	Cincinnati silt loam, 6 to 12 percent slopes, slightly eroded	33	2C	IIIe
CcC2	Cincinnati silt loam, 6 to 12 percent slopes, moderately eroded	33	2D	IIIe
CcD1	Cincinnati silt loam, 12 to 18 percent slopes, slightly eroded	33	2F	IVe
CcD2	Cincinnati silt loam, 12 to 18 percent slopes, moderately eroded	33	2F	IVe
CcE1	Cincinnati silt loam, 18 to 25 percent slopes, slightly eroded	34	2G	VIe
CcE2	Cincinnati silt loam, 18 to 25 percent slopes, moderately eroded	34	2G	VIe
CcF2	Cincinnati silt loam, 25 to 45 percent slopes, eroded	34	2H	VIIe
CnC3	Cincinnati soils, 6 to 12 percent slopes, severely eroded	33	2E	IVe
CnD3	Cincinnati soils, 12 to 18 percent slopes, severely eroded	34	2F	VIe
CnE3	Cincinnati soils, 18 to 25 percent slopes, severely eroded	34	2G	VIIe
Co	Cope silt loam	35	6A	IIw
Cp	Cope silty clay loam	35	6A	IIw
CrA	Crosby silt loam, 0 to 2 percent slopes	36	5A	IIw
CrB1	Crosby silt loam, 2 to 6 percent slopes, slightly eroded	36	5B	IIw
CrB2	Crosby silt loam, 2 to 6 percent slopes, moderately eroded	36	5B	IIw
De	Delmar silt loam	36	5A	IIIw
Ee	Eel loam	37	7B	IIw
Es	Eel silt loam	37	7B	IIw
FaB	Fairmount silty clay loam, 2 to 6 percent slopes	38	3A	IVe
FaC	Fairmount silty clay loam, 6 to 12 percent slopes	38	3A	IVe
FaD	Fairmount silty clay loam, 12 to 18 percent slopes	38	3B	IVe
FaE	Fairmount silty clay loam, 18 to 25 percent slopes	38	3C	VIe
FaF	Fairmount silty clay loam, 25 to 35 percent slopes	38	3C	VIIe
FaG	Fairmount silty clay loam, 35 to 50 percent slopes	38	3D	VIIe
FcA	Fincastle silt loam, 0 to 2 percent slopes	39	5A	IIw
FcB1	Fincastle silt loam, 2 to 6 percent slopes, slightly eroded	39	5B	IIw
FcB2	Fincastle silt loam, 2 to 6 percent slopes, moderately eroded	39	5B	IIw
FeA	Fincastle and Crosby silt loams, 0 to 2 percent slopes	39	5A	IIw
FeB	Fincastle and Crosby silt loams, 2 to 6 percent slopes	39	5B	IIw
FeB2	Fincastle and Crosby silt loams, 2 to 6 percent slopes, eroded	40	5B	IIw
FmA	Fox loam, 0 to 2 percent slopes	40	4A	IIs
FmB1	Fox loam, 2 to 6 percent slopes, slightly eroded	40	4B	IIs
FmB2	Fox loam, 2 to 6 percent slopes, moderately eroded	41	4C	IIs
FmC2	Fox loam, 6 to 12 percent slopes, moderately eroded	41	4D	IIIs
FnA	Fox silt loam, 0 to 2 percent slopes	41	4A	IIs
FnB1	Fox silt loam, 2 to 6 percent slopes, slightly eroded	41	4B	IIs
FnB2	Fox silt loam, 2 to 6 percent slopes, moderately eroded	41	4C	IIs
FnC2	Fox silt loam, 6 to 12 percent slopes, moderately eroded	42	4D	IIIs
FnD1	Fox silt loam, 12 to 18 percent slopes, slightly eroded	42	4F	IVs
FnD2	Fox silt loam, 12 to 18 percent slopes, moderately eroded	42	4F	IVs
FoB2	Fox silt loam, kames, 2 to 6 percent slopes, moderately eroded	42	4C	IIs
FoC2	Fox silt loam, kames, 6 to 12 percent slopes, moderately eroded	42	4D	IIIs
FpC3	Fox soils, 6 to 12 percent slopes, severely eroded	42	4E	IVs
FrC3	Fox soils, kames, 6 to 12 percent slopes, severely eroded	43	4E	IVs
FsD2	Fox and Rodman loams, 12 to 18 percent slopes, moderately eroded	43	4F	IVs, VIe
FtD2	Fox and Rodman loams, kames, 12 to 18 percent slopes, moderately eroded	43	4F	IVe, VIe
FtE2	Fox and Rodman loams, kames, 18 to 25 percent slopes, moderately eroded	43	4G	VIe, VIIe
FvD3	Fox and Rodman soils, 12 to 18 percent slopes, severely eroded	43	4F	VIe, VIIe
FxD3	Fox and Rodman soils, kames, 12 to 18 percent slopes, severely eroded	43	4F	VIe
Ge	Genesee fine sandy loam	44	7A	I
Gg	Genesee gravelly loam	44	7A	I
Gm	Genesee loam	44	7A	I
Go	Genesee loam, high bottom	44	7A	I
Gs	Genesee silt loam	43	7A	I
Gt	Genesee silt loam, high bottom	44	7A	I
Gv	Gravel pits [2]	44		
HeF1	Hennepin loam, 25 to 35 percent slopes, slightly eroded	45	3C	VIIe
HeF2	Hennepin loam, 25 to 35 percent slopes, moderately eroded	45	3C	VIIe
HeG1	Hennepin loam, 35 to 50 percent slopes, slightly eroded	45	3D	VIIe
HeG2	Hennpein loam, 35 to 50 percent slopes, moderately eroded	45	3D	VIIe
Ho	Homer silt loam	46	5A	IIw
Ko	Kokomo silty clay loam	46	6A	IIw
La	Lake beach [2]	46		
Ma	Made land [2]	46		
MbA	Manlove silt loam, 0 to 2 percent slopes	47	1A	I

See footnotes at end of guide.

Map symbol	*Soil*	*Page*	*Management group* [1]	*Capability class and subclass* [1]
MbB1	Manlove silt loam, 2 to 6 percent slopes, slightly eroded	47	1B	IIe
MbB2	Manlove silt loam, 2 to 6 percent slopes, moderately eroded	47	1C	IIe
McA	Martinsville silt loam, 0 to 2 percent slopes	48	1A	I
McB1	Martinsville silt loam, 2 to 6 percent slopes, slightly eroded	48	1B	IIe
McB2	Martinsville silt loam, 2 to 6 percent slopes, moderately eroded	48	1C	IIe
McC2	Martinsville silt loam, 6 to 12 percent slopes, moderately eroded	48	1F	IIIe
McD2	Martinsville silt loam, 12 to 18 percent slopes, moderately eroded	48	1J	IVe
MmA	Miami silt loam, 0 to 2 percent slopes	49	1A	I
MmB1	Miami silt loam, 2 to 6 percent slopes, slightly eroded	49	1B	IIe
MmB2	Miami silt loam, 2 to 6 percent slopes, moderately eroded	49	1C	IIe
MmC1	Miami silt loam, 6 to 12 percent slopes, slightly eroded	49	1E	IIIe
MmC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded	50	1F	IIIe
MmD1	Miami silt loam, 12 to 18 percent slopes, slightly eroded	50	1H	IVe
MmD2	Miami silt loam, 12 to 18 percent slopes, moderately eroded	50	1J	IVe
MmE1	Miami silt loam, 18 to 25 percent slopes, slightly eroded	50	1K	VIe
MmE2	Miami silt loam, 18 to 25 percent slopes, moderately eroded	50	1K	VIe
MsB3	Miami soils, 2 to 6 percent slopes, severely eroded	50	1D	IIIe
MsC3	Miami soils, 6 to 12 percent slopes, severely eroded	50	1G	IVe
MsD3	Miami soils, 12 to 18 percent slopes, severely eroded	50	1J	VIe
MsE3	Miami soils, 18 to 25 percent slopes, severely eroded	50	1L	VIIe
MtB1	Milton silt loam, 2 to 6 percent slopes, slightly eroded	51	1B	IIe
MtB2	Milton silt loam, 2 to 6 percent slopes, moderately eroded	51	1C	IIe
Nn	Nineveh loam	52	4A	IIs
OcA	Ockley silt loam, 0 to 2 percent slopes	52	4A	I
OcB1	Ockley silt loam, 2 to 6 percent slopes, slightly eroded	52	4B	IIe
OcB2	Ockley silt loam, 2 to 6 percent slopes, moderately eroded	52	4C	IIe
OcC2	Ockley silt loam, 6 to 12 percent slopes, moderately eroded	53	4D	IIIe
OkB3	Ockley soils, 2 to 6 percent slopes, severely eroded	53	4C	IIIe
OkC3	Ockley soils, 6 to 12 percent slopes, severely eroded	53	4E	IVe
ReA	Reesville silt loam, 0 to 2 percent slopes	53	5A	IIw
ReA2	Reesville silt loam, 0 to 2 percent slopes, moderately eroded	54	5A	IIw
ReB2	Reesville silt loam, 2 to 6 percent slopes, moderately eroded	54	5B	IIw
RgD2	Rodman gravelly loam, 12 to 18 percent slopes, moderately eroded	54	4F	VIe
RgE1	Rodman gravelly loam, 18 to 25 percent slopes, slightly eroded	54	4G	VIIe
RgE2	Rodman gravelly loam, 18 to 25 percent slopes, moderately eroded	54	4G	VIIe
RgF2	Rodman gravelly loam, 25 to 50 percent slopes, eroded	54	4H	VIIe
Ro	Ross silt loam	55	7A	I
RsA	Russell silt loam, 0 to 2 percent slopes	56	1A	I
RsB1	Russell slit loam, 2 to 6 percent slopes, slightly eroded	56	1B	IIe
RsB2	Russell silt loam, 2 to 6 percent slopes, moderately eroded	56	1C	IIe
RsC1	Russell silt loam, 6 to 12 percent slopes, slightly eroded	56	1E	IIIe
RsC2	Russell silt loam, 6 to 12 percent slopes, moderately eroded	56	1F	IIIe
RsD1	Russell silt loam, 12 to 18 percent slopes, slightly eroded	57	1H	IVe
RsD2	Russell silt loam, 12 to 18 percent slopes, moderately eroded	57	1J	IVe
RsE1	Russell silt loam, 18 to 25 percent slopes, slightly eroded	57	1K	VIe
RsE2	Russell silt loam, 18 to 25 percent slopes, moderately eroded	57	1K	VIe
RtB3	Russell soils, 2 to 6 percent slopes, severely eroded	56	1D	IIIe
RtC3	Russell soils, 6 to 12 percent slopes, severely eroded	57	1G	IVe
RtD3	Russell soils, 12 to 18 percent slopes, severely eroded	57	1J	VIe
RtE3	Russell soils, 18 to 25 percent slopes, severely eroded	57	1L	VIIe
RuA	Russell and Miami silt loams, 0 to 2 percent slopes	57	1A	I
RuB1	Russell and Miami silt loams, 2 to 6 percent slopes, slightly eroded	57	1B	IIe
RuB2	Russell and Miami silt loams, 2 to 6 percent slopes, moderately eroded	58	1C	IIe
RuC1	Russell and Miami silt loams, 6 to 12 percent slopes, slightly eroded	58	1E	IIIe
RuC2	Russell and Miami silt loams, 6 to 12 percent slopes, moderately eroded	58	1F	IIIe
RvB3	Russell and Miami soils, 2 to 6 percent slopes, severely eroded	58	1D	IIIe
RvC3	Russell and Miami soils, 6 to 12 percent slopes, severely eroded	58	1G	IVe
Rw	Riverwash [2]	54		
Sh	Shoals silt loam	58	7B	IIw
Sn	Sloan silt loam	59	6B	IIw
We	Westland silt loam	59	6C	IIw
WhA	Whitaker silt loam, 0 to 2 percent slopes	60	5A	IIw
WhB	Whitaker silt loam, 2 to 6 percent slopes	60	5B	IIw
WnB1	Wynn silt loam, 2 to 6 percent slopes, slightly eroded	61	1B	IIe
WnB2	Wynn silt loam, 2 to 6 percent slopes, moderately eroded	61	1C	IIe
WnC2	Wynn silt loam, 6 to 12 percent slopes, moderately eroded	61	1F	IIIe
WnD2	Wynn silt loam, 12 to 25 percent slopes, moderately eroded	61	1J	IVe
WyC3	Wynn soils, 6 to 12 percent slopes, severely eroded	61	1G	IVe
XeA	Xenia silt loam, 0 to 2 percent slopes	62	1A	I
XeB1	Xenia silt loam, 2 to 6 percent slopes, slightly eroded	62	1B	IIe
XeB2	Xenia silt loam, 2 to 6 percent slopes, moderately eroded	62	1C	IIe
XnA	Xenia and Celina silt loams, 0 to 2 percent slopes	62	1A	I
XnB1	Xenia and Celina silt loams, 2 to 6 percent slopes, slightly eroded	62	1B	IIe
XnB2	Xenia and Celina silt loams, 2 to 6 percent slopes, moderately eroded	62	1C	IIe

[1] See table 1, p. 2, for management groups and capability classes and subclasses and table 2, p. 21, for estimated crop yields; see table 3, p. 28, for the acreage and proportionate extent of the soils.

[2] Not placed in a management group or given a capability classification.



Areas surveyed in Indiana shown by shading.